

AN EXAMINATION OF THE UTILITY OF
THE HEALTH BELIEF MODEL FOR PREDICTING
ADULT PARTICIPATION IN AEROBIC EXERCISE

By

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By

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Prior research on successful exercise adoption has focused on programmatic and behavioral aspects of exercise programs, often omitting personal factors. This study was designed to focus on individual beliefs contributing to aerobic exercise adoption, using the Health Belief Model (HBM) as a foundation for the instrument developed. The beliefs selected for examination in this study were perceived benefits of aerobic exercise, perceived barriers to aerobic exercise, perceived susceptibility to disease, perceived severity of possible disease conditions, and general health motivation. The two purposes of the study were to develop a valid and reliable measure of beliefs related to aerobic exercise and to test the performance of the beliefs in predicting aerobic exercise participation.

A survey based on the HBM was developed to assess respondents' beliefs about exercise and health. The questionnaire was sent twice to a convenience sample of 334 adult faculty at a mid-sized college in central New Jersey. The first administration of the questionnaire yielded 179 usable responses, with 165 received in the retest administration.

The questionnaire was evaluated by an item analysis and measures of content validity, internal reliability (alpha coefficients from 0.832 to 0.935 were found for the final five scales), and test-retest reliability ($r=0.813$ for the total scale). Based on these tests it was concluded that the measure was reliable with indications of validity. Correlational and factor analysis tests of the independence of the beliefs constructs as operationalized in the questionnaire found some association between the scales.

Multiple regressions and discriminant function analyses were computed, providing predictive validity of the beliefs measure for the criterion variables of exercise adoption stage and level of exercise reported by subjects. The independent belief variables accounted for 35% of overall variance (multiple r square) for categories of exercise behavior, 40% for exercise adoption stages in multiple regressions on these variables. The instrument performed best in distinguishing between sedentary

subjects and aerobic exercisers, accounting for 51% of overall variance and correctly classifying 82% of the subjects. The main predictor for the criterion categories was identified as perceived barriers to aerobic exercise, corroborating similar research using HBM beliefs to explain other preventive behavior.

CHAPTER 1 INTRODUCTION

The Costs of Illness and Solutions Offered by Counseling Psychology

Americans spend eleven and one half percent of their gross national product for health care in all its forms ("A Solution", 1988). This figure represents a two percent increase since 1984, when concerted efforts began to limit the growth of spending, and a five and a half percent increase since 1965. In 1990, the projected share of the GNP devoted to health care is expected to be twelve percent, for a total expenditure of 750 billion dollars (Kiesler & Morton, 1988).

It has been noted that "health" care actually refers primarily to interventions with an illness, not to actual promotion of health; only about two percent of U.S. expenditures on health are for disease prevention and control measures (Knowles, 1977). The rest of the budget primarily services the Medicare and Medicaid programs, programs oriented primarily toward remediation of existing illness or injury.

This allocation of budget priorities misses the cause of many of the illnesses treated, allowing the genesis of most health problems to go unchanged and unaddressed. Janis, in an article detailing counselor behavior

effective in supporting client behavior change, notes that "the most serious medical problems that today plague the majority of Americans and Europeans are not primarily medical; they are behavioral problems requiring the alteration of personal habits, preferences, and decisions." (Janis, 1983, p. 146). Supporting this observation, Powell (1988) cited an analysis of the causes leading to lost years of life, noting that Lifestyle factors were the largest proportion at 53 percent. Following Lifestyle, in order, were Environment (22%), Human Biology (16%), and the Health Care System itself (10%; note: percentages rounded).

The lack of effort in the area of disease prevention and control is not for lack of knowledge about what personal health behavioral changes might be effective. Belloc and Breslow (1972), in a very large longitudinal study of over 7000 adults, found seven health practices significantly related to health and life expectancy: 1) three meals a day at regular times and no snacking; 2) breakfast every day; 3) moderate exercise two or three times a week; 4) adequate sleep; 5) no smoking; 6) moderate weight; 7) no alcohol or only in moderation. A 45-year-old man who practices 6-7 of these habits has a life expectancy ten and one-half years longer than one who practices 0-3 of them (Belloc & Breslow, 1972). Despite

the availability of this study and others like it, few programs to alter behavior exist.

Part of the problem in adopting a health promotion focus is with the lack of immediacy of results from efforts directed at changing health habits. Knowles (1977), in comparing such an undertaking to traditional public health practice, found "the knowledge required to persuade the individual to change his habits is far more complex, far less dramatic in its results, far more difficult to organize and convey--in short, far less appealing and compelling than the need for immunization" (p. 61). For the person with questionable health habits, the personal consequences of those habits are not visible in their daily accretion or change, making programs for behavior change difficult to target and execute.

In a description of the World Health Organization's Health for All by the Year 2000 (HFA/2000) program, Diekstra and Jansen (1988) note a large potential role for the profession of psychology in accomplishing the ambitious goals set forth there. They specify the fields of psychological medicine, behavioral medicine, and health psychology. As HFA/2000 concerns itself chiefly with prevention and health-enhancing lifestyles, imagining its realization without psychological support is indeed difficult (WHO, 1981).

Many possible contributions of the field of psychology with the goals of HFA/2000 can be identified. Kiesler and Morton (1988) describe such opportunities for "psychology in the public interest", citing facets of psychology that well suit it to preventive efforts in the area of health: 1) an empirical orientation; 2) expertise not traditionally allied with medicine and health care; 3) emphasis on both prevention and wellness; and 4) knowledge about the effect of the environment on behavior and well-being. Such expertise is pivotal to the ultimate aim of changing behavior to reduce risk factors in the population at large.

Indeed, the concept of "behavioral health" has been discussed for most of this century, with some recent attempts to specify and codify what is meant by the term. Matarazzo (1980) defines behavioral health as

a new interdisciplinary field dedicated to promoting a philosophy of health that stresses individual responsibility in the application of behavioral and biomedical science knowledge and techniques to the maintenance of health and the prevention of illness and dysfunction by a variety of self-initiated individual or shared activities." (p. 813. Emphasis in original).

He proposes this field as a way of progressing beyond the limits of traditional approaches to health.

In a discussion of the potential role of counseling psychology in public health, Thoresen and Eagleston (1985) emphasize the traditional educational model that serves as a foundation for the field. This approach lends itself to

health promotion in two related ways: "(1) the promotion and maintenance of good health through the development of healthy habits and lifestyle . . . (2) the prevention and treatment of disease through changing unhealthy behaviors, especially those that may be associated with certain chronic diseases and health problems." (Thoresen and Eagleston, 1985, p. 70). They argue for consideration of the cognitive, behavioral, and environmental factors that have an impact on the issue of health along with physiological ones.

Harris and Guten (1979) point out that an avenue little explored in the area of health protective behavior is how individuals attempt to attain health as producers of this commodity rather than be consumers of others' services. This suggestion is made in a discussion of their findings in a study of how individual beliefs relate to self-identified health protective behavior. Such a view represents a challenge to the paradigm of conceptualizing health; it also argues for investigation of the personal characteristics that affect involvement in health protective or enhancing activities.

A principal health protective and enhancing activity that is receiving more research attention is aerobic exercise. Regular aerobic exercise has been shown to be beneficial in a number of different human functions, including both physiological and psychological realms (Folkins & Sime, 1981; Morgan, 1981; Paffenbarger and Hyde

(1988); Sinyor, Schwartz, Peronnet, Brisson, & Serganian, 1983; Stern & Cleary, 1981; Taylor, Sallis, & Needle, 1985). The need for exercise can be self-assessed or prescribed by a health professional who has determined an appropriate application. Exercise has been used successfully in the treatment of depression (Greist, Klein, Eischens, Faris, Gurman, & Morgan, 1979), coronary heart disease risk modification (Stern & Cleary, 1981), and obesity (Epstein & Wing, 1980). As has been observed, the problem of adherence has compromised better assessment of the efficacy of exercise in treatment regimens (Martin & Dubbert, 1982).

Even moderate amounts of exercise have been shown to be beneficial. In a very large study examining the relationship varying levels of fitness to subsequent mortality, a group of researchers found a "strong, graded, and consistent inverse relationship between physical fitness and mortality in men and women" (Blair, Kohl, Paffenbarger, Clark, Cooper, & Gibbons, 1989). In reporting their findings the authors observe that the prevalent sedentary lifestyle presents an important public health problem.

Attrition From Exercise Programs

The casual observer might well form the impression that most people in the population at large exercise. Exercisers are quite visible, as are advertisements for

health clubs and other "health-oriented" services. Such an impression would be in error, however, when compared to figures describing actual exercise behavior. A recent overview of American participation in exercise found that only 20% of the population exercise intensely enough and often enough to meet current guidelines for fitness or reduce the risk of chronic disease or premature death. (Dishman, 1988). Another 40% are active to some level, but not enough to derive a fitness benefit. This shows that most Americans fail to perform a behavior with proven efficacy in health promotion and remediation of health problems.

Despite the growing recognition of the value of exercise among professionals and laypersons alike, a continuing pattern is the failure of most beginners in exercise programs to persist in their efforts. This pattern is observed even in the face of urgent medical conditions for which exercise has proven an effective treatment (Carmody, Senner, Malinow, & Matarazzo, 1980; Dishman, Ickes, & Morgan, 1980; Martin & Dubbert, 1982).

Martin and Dubbert (1982) summarized findings on clinical applications and promotion of exercise in behavioral medicine, contending that measuring the efficacy of exercise as a clinical treatment regimen was hampered by poor adherence rates. They maintain that this pattern introduces doubt even in areas where exercise is generally agreed to be effective, as in obesity or

cardiovascular risk reduction. Commenting on the lack of an effective means of keeping patients identified as at-risk in a program of exercise, they state: "we believe that far too little attention has been directed toward the cognitive/psychological/social variables controlling exercise adherence." (Martin & Dubbert, 1982, p. 1013). They recommend the tailoring of individual packages to the needs and profile of the individual undertaking an exercise program. They document a need for more information about the impact of different personal variables on the success or failure of an exercise program before being able to employ such packages successfully.

Attrition, or its parallel phenomenon relapse, is not a problem unique to exercise (McAlister, Farquhar, Thoresen, & Maccoby, 1976; Meichenbaum & Turk, 1987). Representative of a number of writers is the Martin et al. (1984) observation that the exercise relapse curve appears similar to the negatively accelerated curve found for the addictions; the majority of the relapses occur during the first several months, followed by continued, more gradual rates, finally leveling off at one year between 55% and 75% dropout. For exercise, relapse refers to the phenomenon of discontinuing the behavior, as compared to addiction where reference is to resuming an undesirable behavior. Dishman, Ickes, & Morgan (1980), discussing a similar observation, speculate that similar mechanisms may

operate across many behavior change problems. As put in a related study:

the remarkable correspondence between dropout patterns in exercise programs . . . and programs of psychotherapy, as well as drug, alcohol, and smoking treatment, and hypertension control . . . suggests that similar influences may operate across many health care settings. This similarity at least implicates characteristics of the participant as potential adherence predictors. (Dishman & Gettman, 1980, p. 296)

Activity in exercise research has begun to address the problem of attrition from exercise programs, examining the phenomenon in an attempt to identify factors affecting the successful adoption of an exercise regimen (Martin & Dubbert, 1982; Dishman, 1982; Gale, Eckhoff, Mogel, & Rodnick, 1984). In a comprehensive review of these factors Dishman (1982) organized them into areas that take into account all the variables likely to have an impact on the outcome of an exercise adoption attempt. The main areas named include 1) psychological features of the exerciser; 2) biological features of the exerciser, including health status; 3) demographic features of the exerciser; 4) situational characteristics of the exercise setting; 5) strategies/clinical interventions used to encourage adoption of exercise habits; and 6) aspects of the person-setting interface, including ways the interaction between the person and the setting affects subsequent decision-making and behavior. Such a summary is not unique to the particular challenges posed in the area of exercise behavior; similar findings are noted in an analysis of

adherence factors affecting the outcome of treatment regimens prescribed by health care providers (Meichenbaum & Turk, 1987).

Most research on exercise has addressed the social, environmental, and behavioral aspects of the exercise adoption process. Typical of research in the area of exercise adherence is the comprehensive series of studies performed by Martin et al. (1984). In these studies, a decidedly behavioral focus yielded much valuable data about the effects of social support, cognitive strategies to accompany the exercise, relapse prevention training, attendance lotteries, personalized feedback, and the structure of the goal-setting for the individual's exercise program. Using this example in light of the Dishman categories cited above, one can see the emphasis on 4) situational characteristics of the exercise setting; 5) strategies/clinical interventions used to encourage adoption of exercise habits; and 6) aspects of the person-setting interface.

In an already-quoted review that presents a summary of much of the research on exercise adoption, Martin and Dubbert (1982) make the puzzling observation that one's attitude toward exercise does not appear to predict participation or later adherence to a program of exercise. Given the established links between attitudes and behavior (Ajzen & Fishbein, 1977; Cooper & Croyle, 1984) and

specific studies establishing the relationship in the case of other behaviors (Becker, Haefner, Kasl, Kirscht, Maiman, & Rosenstock, 1977), such an observation cannot be accepted as a given without supporting research. The research necessary to determine the presence of such a relationship has only recently commenced (Sonstroem, 1988).

The Health Belief Model and Its Utility in Exercise Adoption Research

As a tool for comprehensive measurement of psychological process, the Health Belief Model has shown consistency and robustness, having value for health practitioners and researchers addressing many varied kinds of behavior (Janz & Becker, 1984). It enables a comprehensive view of many beliefs that influence a person's predisposition to act in a certain way, with the exact mechanism of that influence still under study.

A belief is considered the cognitive part of an attitude toward an object. A belief represents the information an individual has about an object, as compared to the attitude, which represents the individual's overall evaluation of that object. The belief links the object to a quality in the person's mind. Some have postulated a belief to have an emotional component modifying the overall response to an object or action (Sonstroem, 1982). That is, the person's feeling about the outcome of the action in question becomes part of their beliefs about

that action, affecting the valence of their specific and general attitudes, beliefs, and behavioral intention.

The relationship between attitudes and behavior has been a well-documented phenomenon, especially when many elements of the attitude-behavior pair correspond (Ajzen & Fishbein, 1977). Theorists in the area of attitude-behavior relations note the importance of comparable levels of specificity in the attitude and the behavior (Cooper & Croyle, 1984). A general attitude will predict a multiple-act criterion better than a single-act criterion, while a specific attitude works conversely, predicting the single-act criterion better than the multiple-act criterion. The need, as detailed by Godin and Shepard (1986), is for appropriate measures of attitude to be employed in the particular area of exercise behavior.

There has been a long-standing interest in documenting the relationship between attitudes or beliefs and behavior. The Health Belief Model has been one of the most widely utilized of theories that have been formulated to determine the nature and impact of beliefs in the area of health protective behavior. What started as an attempt to identify the factors underlying health behaviors has evolved into a well-documented model with utility in a variety of settings.

The Health Belief Model was developed in an attempt to understand why people did not practice health protective behaviors, first in regard to asymptomatic

diseases, later in an expanding number of conditions and venues. Use of the model was later expanded to investigate factors contributing to compliance with medical regimens, (Becker, Maiman, Kirscht, Haefner, & Drachman, 1977; Becker, Drachman, & Kirscht, 1974) with recent investigations broadening its application to preventive health behaviors (Riddle, 1980; Slenker, Price, Roberts, & Jurs, 1984; O'Connell, Price, Roberts, Jurs, & McKinley, 1985).

An early overview of research employing the model included a statement detailing its utility for health care providers: "by knowing which Health Belief Model components are below a level presumed necessary for behavior to occur, the health worker might be able to tailor intervention to suit the particular needs of the target group or population" (Becker, Haefner, et al., 1977, p. 30). Other investigations into the efficacy of interventions designed to affect peoples' health beliefs and thus subsequent behavior have shown them to be successful (Becker, Maiman, Kirscht, Haefner, & Drachman, 1977; Kirscht, 1974).

The components of the Health Belief Model were posited to identify cognitions and perceptions making up the beliefs that early developers of the model found to have the most impact on health behaviors (Kirscht, Haefner, Kegeles, & Rosenstock, 1966). They include the

individual's subjective estimate of their susceptibility to disease states; the perceived severity of the conditions the individual feels vulnerable to contracting or suffering; perceived benefits of the health protective behavior being researched; and the perceived barriers to performing that behavior. Added later to the Health Belief Model was a construct addressing health motivation, which was seen as a necessary part of the model when examining behaviors with a more preventive or health-enhancing nature (Becker & Maiman, 1975). Finally, having an impact within the framework of the model are cues to action which trigger the individual to act.

The Health Belief Model was described by theoreticians associated with early work in its development as measuring specifically elements of two variables essential to the prediction of behavior: 1) the value placed by an individual on a particular goal (i.e. health or the avoidance of a disease); and 2) the individual's estimate of the likelihood that a given action will result in that goal (Maiman & Becker, 1974). A summation offered by the framers of the model who participated in its refinement includes all the elements:

the Health Belief Model hypothesized that persons will generally not seek preventive care or health screening unless they possess minimal levels of relevant health motivation and knowledge, view themselves as potentially vulnerable and the condition as threatening, are convinced of the efficacy of intervention, and see few difficulties in undertaking the recommended action. (Becker, Haefner, et al., 1977, p. 29)

Investigations employing the Health Belief Model have been successful in their aim of predicting or explaining the level of non-exercise preventive health behaviors. Two evaluations of Health Belief Model research found it to have significance in the degree of association of its principal components with almost every specific behavior under study. The appraisals covered 46 different studies that utilized the Health Belief Model. The pattern of significance held when the type of behavior being investigated was sick role behavior as well as with preventive health behavior, and for earlier as well as more recent studies (Becker, Haefner, et al., 1977; Janz & Becker, 1984). The level of significance for the components was also consistent in both retrospective (n=28) and prospective (n=18) studies. The model appears to have potential as a useful tool for the investigation of factors shaping exercise behavior, one of the most global forms of health-related behavior.

The Role of an Attitude/Beliefs Study in Exercise Adoption Research

The relatively new area of research into exercise adoption has been yielding specific data about the factors that influence successful adoption and maintenance of an exercise habit, particularly from the point of view of the practitioner working with beginning exercisers. Behavior modification approaches, as detailed by Knapp (1988), Martin et al. (1984), and Franklin (1978), have shown

effectiveness at increasing adherence rates. Such approaches now include relapse prevention strategies, integrating newly gained knowledge about habit change. The attractiveness of the exercise itself for the beginning exerciser has been shown to be an important factor (Franklin, 1978; Gale, Eckhoff, Mogel, & Rodnick, 1984), along with the approach used by the instructor in an exercise program.

The term exercise adoption was intentionally used for the current study to help provide emphasis on the dynamics whereby an individual actively seeks to adopt an exercise program as a part of his/her daily behavior. The adoption process is illustrated in a stage theory of change detailed by Prochaska and DiClemente (1983). The process begins with a precontemplation stage, with movement proceeding to a contemplation stage. Actual behavior change begins in the action stage, which becomes the maintenance stage if the change is long-standing and durable. Failure to maintain the change moves the person into a relapse category. Such a schema helps to capture more of the phenomenon of behavior change than just the actual presence or absence of behavior.

The thoughts and feelings of the exerciser have been relatively neglected in research on the exercise adoption process, as compared to examination of the appropriate techniques. An example of one such conceptualization of

personal cognition/self perception is self-efficacy theory (Knapp, 1988; Bandura, 1982). While indications are that exercise self-efficacy plays a role in the subsequent outcome of an attempt to begin an exercise program, results are not conclusive (Sonstroem, 1988). Discussions of psychological characteristics having an impact on habit change outcomes usually mention this construct, but it has not been operationalized for the exercise adoption problem.

The need for such socio-psychological correlates of exercise behavior has been asserted by those conducting cognitive-behavioral programs for change in exercise adherence studies (Martin et al., 1984). The personal characteristics and, occasionally, beliefs that influence decision-making and subsequent behavior have been well documented in the case of other behaviors, even other health-related behaviors, but exercise behavior remains largely unexplored in regard to beliefs.

The Health Belief Model method of assessment has proven validity and reliability in determining individual beliefs, and has become established as a tool for predicting health behavior (Janz & Becker, 1984). The first applications of the model in the area of exercise behavior have proven encouraging, with limited generalizability to all forms of exercise (Riddle, 1980; Sonstroem, 1987; Slenker, Price, Roberts, & Jurs, 1984).

Dishman (1982) states the need to "determine the effectiveness of various potential adherence strategies . . . Consider the relative effectiveness of manipulating abstract, conceptual beliefs" (p. 261). To date little activity has focused on the development of interventions to effect changed beliefs in those seeking to adopt exercise behavior as part of their lifestyle. The primary focus with the Health Belief Model up to now has been an individual's participation in medical or disease-prevention strategies. The current study was proposed to provide a basis for a structured intervention to increase the success rates for exercise adoption efforts. With the capability to reliably assess beliefs about health and exercise, the efficacy of such interventions may be evaluated.

Aerobic Exercise and Health Beliefs

Extending the Health Belief Model mode of research to the area of aerobic exercise behavior is a step indicated by other prior studies that have explored the role of health beliefs in preventive health behavior, including specific forms of exercise. The present study was designed to show that a reliable and valid mechanism of measurement of beliefs regarding exercise can be developed, including a demonstration of predictive validity of the instrument in reference to self-reported aerobic exercise adoption stages and levels of aerobic exercise.

Individual tailoring of programs to each person seeking to begin an aerobic exercise program (whether self-motivated or prescribed) has been recommended for greater success achieving lasting change and implementing the goal of an exercise regimen (Gale, Eckhoff, Mogel, & Rodnick, 1984). Circumstances for a prescribed aerobic exercise program may be weight reduction or cardiovascular rehabilitation, while many reasons have been cited by people undertaking exercise programs voluntarily, from appearance to preparation for participation in a sport. A specific, comprehensive beliefs measure would provide for identification of personal beliefs relevant to entry into an aerobic exercise program.

Martin and his fellow researchers have identified many of the program strategies and interpersonal approaches that enable the fitting of an exercise adoption approach to the needs of the person starting a program of exercise (Martin et al., 1984; Martin & Dubbert, 1982). Missing from the daily practice of health care workers who address the exercise adoption challenge is a consideration of the individual's attitudes and beliefs about the undertaking. Such an omission is, in part, due to lack of a means with which to assess a person's beliefs about health and exercise.

An historical drawback in Health Belief Model research is that measures employed to assess belief

constellations for the behavior under study have been idiosyncratic to each particular investigation.

Surprisingly, no one procedure of instrumentation has emerged as a standard in any area covered by the dozens of studies utilizing the Health Belief Model. In one attempt to organize and verify the reliability and validity of constructs within the Health Belief Model, the researchers comment on the limitations imposed by the lack of such work:

The absence of reliable and valid measures not only limits the practical utility of the theoretical formulation, but also reduces the potential for developing a reliable body of knowledge on which to design intervention strategies to change personal health behavior. (Jette, Cummings, Brock, Phelps, & Naessens, 1981, p. 83)

No attempt has been made to develop a standard instrument to be employed as an adjunct for aerobic exercise adoption situations, whether for research purposes or for use as a treatment component.

Applying the Health Belief Model to Aerobic Exercise Behavior

In studies where interventions utilizing Health Belief Model components have been performed, successful changes in targeted preventive health behaviors were effected (Beck & Lund, 1981; Becker, Maiman, Kirscht, Haefner, & Drachman, 1977). Behaviors included oral hygiene care and mothers' successful follow-through on treatment for their childrens' obesity. The technique of beliefs modification has favorable potential as a method

for influencing the process of behavior change, specifically the adoption of aerobic exercise behavior.

No definite relationship has been established between the Health Belief Model components and aerobic exercise as a dependent variable. The purpose of the present study was to test for a link between the belief variables of the Health Belief Model and aerobic exercise, using a methodology paralleling prior, successful preventive health behavior investigations. In these earlier studies, the use of beliefs assessment instruments has provided for successful prediction of a variety of targeted preventive health behaviors (Tirrell & Hart, 1980; Chen & Tatsuoka, 1984; O'Connell, Price, Roberts, Jurs, & McKinley, 1985). Previous studies have shown the Health Belief Model to have similar potential in the successful measurement of relevant beliefs and the prediction of aerobic exercise behavior (Riddle, 1980; Slenker, Price, Roberts, & Jurs, 1984).

A valid instrument for assessing beliefs in reference to aerobic exercise will provide a basis for successful employment of belief component manipulations in public health, recreation, and counseling settings, toward the end of positive improvements in the adoption of aerobic exercise behaviors. Belief manipulations can range from personalized, one-on-one discussions to mass media campaigns that involve an entire community. Such regimens have been proven effective even on a very large scale. An

example of one such intervention often cited is the Stanford Five-City Project, where significant reductions in cardiovascular risk factors occurred over a thirty month period following an ongoing public health information campaign (Thoresen & Eagleston, 1985).

The method proposed parallels that used in successful applications of the Health Belief Model to explain and predict other preventive health behavior, as well as that used in earlier applications of the model in the example of illness avoidance/sickness reduction. As has been noted, correlations of model components with target behaviors that were obtained in past investigations have been significant, with some variation in the degree of significance. Initial exploration of the constellation of health beliefs for exercisers has yielded encouraging results. These findings have provided a foundation for an effort to develop an instrument for determining Health Belief Model beliefs in reference to aerobic exercise (Sonstroem, 1987; Slenker, Price, Roberts, & Jurs, 1984; Riddle, 1980). Such an instrument would provide the basis for measurement that would enable assessment of any subsequent manipulation of beliefs, in that change could then be reliably measured.

Posing the Health Belief Model constructs in the context of a standard definition of aerobic exercise (American College of Sports Medicine, 1978) allows for

corroborative research and provides a basis for comparisons to be made on the basis of a general consideration of aerobic exercise, not just one particular form. The College guidelines specify exercise quantity and quality: 1) Frequency of training 3-5 days per week; 2) Intensity of training 60%-90% of maximum heart rate reserve; 3) Duration of training 15-60 minutes of continuous aerobic activity, with duration dependent on intensity; and 4) A mode of activity that involves large muscle groups, that can be maintained continuously, and is rhythmical and aerobic in nature (American College of Sports Medicine, 1978, p. vii). The structure of the current investigation was intended to provide a meaningful foundation for future intervention studies to be attempted, as well as other prospective studies that monitor behavior change given an initial constellation of beliefs.

In the following chapter, a more detailed examination of the literature in the areas of exercise and exercise adoption will be presented, including theory and practice in exercise adoption, adherence, and compliance contexts. A close inspection of factors affecting the exercise adoption process will follow, including cognitive, behavioral, and interpersonal elements. The Health Belief Model and its application in other studies will then be presented, along with investigations documenting the suitability of the Model for aerobic exercise adoption

research and practice. Particular issues affecting the development and use of an instrument to measure beliefs about aerobic exercise will also be examined. Chapters 3 and 4 will describe the development, evaluation, and testing of the beliefs/exercise assessment instrument. In Chapter 5, specific findings and the implications of the results for future investigations utilizing Health Belief Model theory will be discussed, as well as indications for the area of exercise adoption research in general.

CHAPTER 2 REVIEW OF THE LITERATURE

The following review will examine the literature on exercise, exercise adoption, adherence to exercise programs and the factors affecting adherence. Also to be examined is the Health Belief Model and its use as an explanatory tool in research on peoples' health-related decision-making and behavior. Finally, research relevant to the decision to apply the Health Belief Model in the exercise adoption context will be reviewed.

The Benefits of Exercise

The benefits of regular exercise seem almost without question; the findings, however, are not as unqualified as the casual observer might expect. Many different kinds of studies have been performed in an effort to ascertain exercise effects along a continuum ranging from very narrow, specific questions to very broad, inclusive ones. An example of the former is a study by Sohn and Micheli (1984) that investigates the effect of running on the development of a specific form of arthritis, an example of the latter is Folkins & Sime's (1981) analysis of exercise effects on mental health. Their review was a critical examination of the results of over 39 studies

investigating the impact of exercise on psychological states.

Research studies on exercise also vary according to type of exercise, length of exercise, the method of monitoring adherence to an exercise program, and the various groups of subjects studied. The following review will focus on research that utilizes a more general, inclusive definition of aerobic exercise, that is exercise that produces an elevated heart rate for extended periods. Another factor assumed and sought as an element of the research cited is regular, versus episodic, participation in programs of exercise. Factors utilized in the selection follow from American College of Sports Medicine (1978) recommendations about the quantity and quality of exercise needed for "developing and maintaining cardiorespiratory fitness and body composition in the healthy adult" (American College of Sports Medicine, 1978, p. vii). The effects "bias" in selecting research on benefits is toward psychological results.

Stern and Cleary (1981) citing Naughton (1974) list a summary of the clinically observable physiological benefits of exercise, illustrating the pattern of changes that accompany improved fitness. They include

- 1) significant reduction of heart rate and systolic blood pressure, at rest and at work; 2) significant increases in peak oxygen uptake; 3) significant decreases in myocardial

(heart muscle) work at rest and at work; 4) changes in body composition, including reduced fat and increased muscle mass; and 5) changes in circulation to patterns observed in healthy, physically active subjects. This pattern is noted in many studies as the training effect, and various of the features are often used to test for fitness levels, as they were in the Stern and Cleary (1981) study on changes in a population of exercisers who had suffered myocardial infarct.

In a chapter examining the effect of exercise on coronary heart disease (CHD) rate and risk, Paffenbarger and Hyde (1988) found significant differences in longitudinal studies of two very different populations. For a group of 3,686 San Francisco longshoremen, those in the group who had the highest levels of physical activity as part of their jobs were found to have significantly less risk of CHD than their counterparts who did not work as hard. This effect held for all age groups, and was strongest for the youngest age group. The groups were studied over a 21-year period, with the work level of 8,500 kilocalories per week used as the cutoff between low- and high-energy-output groups. In an impressive finding, the degree of increased CHD risk was greater for those who were in a low energy output group (versus a high output group) than the increased risk that accrued for being a heavy cigarette smoker (greater than one pack a

day) or for having high blood pressure (greater than or equal to the mean level for the age cohort)!

A parallel study, involving 16,936 Harvard alumni, found similar results. Alumni engaging in strenuous activity plus a minimum of 1000 kilocalories a week of other light activities had less than half the CHD incidence of their nonathletic, sedentary classmates (Paffenbarger & Hyde, 1988). Exercise was found to be the second most influential factor affecting mortality from CHD causes, preceded by smoking and followed by hypertension. Exercise was second only to parental history of hypertension in its impact on whether the alumni developed hypertension themselves.

Recent results demonstrate some of the likely mechanisms by which regular exercise may contribute to lower CHD mortality. A study investigating the impact of exercise on blood cholesterol levels found that "good" cholesterol (HDL or high density lipoprotein) began increasing while "bad" cholesterol (LDL/VLDL or low/very low density lipoprotein) began decreasing after a seven week exercise program, a fairly rapid effect of exercise. The program consisted of four sessions per week of treadmill running for twenty minutes per session to 80% predicted maximum heart rate. Subjects ate a controlled diet and underwent frequent blood testing to assess lipoprotein and other blood element levels. A parallel

finding was a significant decrease in postprandial levels of lipoproteins, showing a faster uptake of cholesterol (Weintraub, Rosen, Otto, Eisenberg, & Breslow, 1989).

Exercise was demonstrated to have a positive effect on the coping responses to a stressor when trained and untrained subjects were compared. Heavy aerobic exercisers were assigned to the trained group, while non-exercisers comprised the untrained group. In addition to a standard "training effect", (Higher maximal oxygen uptake, lower blood pressure) subjects showed a faster adaptive biochemical response when subjected to a psychosocial stressor (Sinyor, Schwartz, Peronnet, Brisson, and Serganian, 1983). Catecholamine levels peaked earlier, and at higher levels, for the trained subjects. This effect was described by the authors as a more efficient coping arousal. Additionally, heart rate returned to normal more quickly in the trained group of subjects, reflecting a recovery from the experience of the stressor that was faster than in the untrained group.

Stern and Cleary (1981), in the above-noted study on a male post-infarct population of exercisers, noted an increased work capacity for the exercisers as measured in testing on a motorized treadmill. Their program of low-level exercise consisted of two to three sessions per week for six weeks for an average of 15 minutes of exercise per session. This program produced an average ten

percent increase in the work capacity of subjects over the course of the study.

Wilfey and Kunce (1986) found the magnitude of training benefit to be greater for subjects with lower initial fitness levels, in both physiological and psychological measures. For low fitness/high stress subjects the overall changes were the greatest, as might be projected for people of the group with the most to gain from completing a two month long comprehensive exercise training program. Heart rate decreases were greatest for the low fitness/high stress group, followed in order by the low fitness/low stress group, the high fitness/high stress group, and the high fitness/low stress group. A similar pattern obtained in measuring gains on a fitness test, with the high fitness/low stress and high fitness/high stress groups exchanging ranks. The finding that persons of lower fitness gain more from training than those at higher fitness levels may seem obvious, but it also illustrates the linear nature of the physiological gains obtainable through an exercise training program.

Many psychological benefits have been documented as a product of regular exercise, with findings consistent through many studies. The positive effects can be identified with a high degree of certainty as associated with the exercise itself and not with other variables. Well-controlled studies do vary in the specific effects

noted, often as a result of their initial focus or particular changes identified as the target of the investigation.

In a review of his own and others' work on the short and long term effects of exercise, Morgan (1981) found some consistent indications that regular exercise, performed for a minimum of twelve weeks, results in lower scores on anxiety and depression scales, while measures of well-being increased. This pattern held across different measures and different periods of exercise beyond the twelve week minimum. Morgan concludes that exercise is clearly associated with changes in the three areas, with an additional observation that causality is harder to prove.

A related study found reduced levels of anxiety in physically trained subjects following exposure to a psychosocial stressor when compared to untrained subjects (Sinyor, Schwartz, Peronnet, Brisson, & Serganian, 1983). Aerobic points earned and physiological response measures were used to differentiate trained from untrained subjects. The anxiety measure was the Spielberger State Anxiety Inventory, administered prior to and following different stressor tasks. Following the tasks, trained subjects had significantly lower SSAI scores, showing faster recovery from induced anxiety.

One of the largest, most complete studies was conducted on a population of 651 subjects that had experienced a myocardial infarct less than three years prior to their involvement in the research. Stern and Cleary (1981) investigated the psychosocial effects of a low level exercise program on participants, finding a decrease in the percentage of depressed subjects and in depression scores as measured by the MMPI depression subscale. On a group of twelve clinical symptoms, persisters in the exercise program improved on ten of the twelve as rated by spouses. Differences were found to be significant between the initial and followup evaluations, which were administered six weeks apart. Although the authors see the exercise group as benefiting more than a non-exercise group, they qualify the finding as not being wholly attributable to the exercise component.

One of the most thorough evaluations of the impact of exercise on mental health was a review of research conducted by Taylor, Sallis, and Needle (1985). They found positive effects in many of the studies they examined where exercise was used as a treatment modality for clinical conditions, many with a significant degree of change. Mild to moderate depression was cited as showing the most promise for change, with many studies documenting positive effects. The hypothesized mechanisms of change in exercise programs used to treat depression, while not

certain, were increased neurotransmission of catecholamines, endogenous opiates, or both; diversion, social reinforcement, and improved self-efficacy.

Taylor et al. (1985) found both state and trait anxiety to be effectively reduced by varying levels of exercise, with a greater effect noted in subjects whose initial anxiety levels were higher. Effects were more conclusive for state anxiety than for trait anxiety, with both types showing a positive benefit in most studies examined. The primary effective mechanisms here were described as diversion, social reinforcement, experience of mastery and an improved response to stress. Taylor et al. (1985) also noted that improved self-confidence, cognitive function, and sense of well-being were associated with exercise and physical activity.

Perhaps the most complete of the major studies reviewing the impact of exercise on mental health is the massive compilation by Folkins and Sime (1981). Their critical review is often cited in other studies as a significant overall finding of the beneficial effects of exercise on human psychological function. Often omitted in a citation of their work is the observation that most of the research on exercise effects that they reviewed were not true experimental designs. They note a preponderance of pre-experimental or quasi-experimental designs, a drawback that is particularly limiting in longitudinal

studies. Even within the true experimental research, however, a pattern of positive effects is cited.

Folkins and Sime (1981) found fitness to be related to the following aspects of mental health: 1) improved work patterns, including reduced absenteeism, fewer errors, and improved output; 2) improvement in mood state, particularly for distressed or initially unfit individuals; 3) improved self-concept and body image; 4) reduced levels of depression where exercise is used for treatment of depression; and 5) improved cognitive function. The authors caution that in some instances the results obtained in a study were not significant; overall they were convinced of the utility of exercise in producing improved psychological states. They single out self-concept and depression as areas where the results are less equivocal.

In a carefully controlled study, Bahrke and Morgan (1978) compared exercise, meditation, and quiet rest to determine their relative efficacy at inducing relaxation for experimental subjects. Each "treatment" was employed for twenty minute periods, with the exercise condition being treadmill walking to seventy percent of age-specific maximal heart rate. Relaxation was measured using a state anxiety scale that was employed preceding, immediately following and ten minutes following the experimental

conditions. All three treatments were effective in reducing anxiety, causing decrements that differed significantly from the initial measurement. Interestingly, the three treatments did not differ significantly from each other in their effects. The authors found the findings striking in that the mechanism of exercise (physiological arousal) is so different from that of either quiet rest or meditation in the quality of its effects. They also found the exercise effects corroborated earlier investigations into the impact of exercise on anxiety levels. It must be noted that "lack of anxiety" may not be a universal criterion for relaxation; given the arousal aftereffects on physiological measures it was the choice for this study.

Morgan and O'Conner (1988) have summarized some limitations in the studies which document the positive effects of various forms of exercise on mental health. They note a unanimity among researchers that the higher the level of fitness, the more desirable the level of mental health. Next is noted the elusive nature of evidence allowing clear statements of causality. Finally, the lack of controlled studies with true experimental designs, as noted above in the review by Folkins and Sime (1981), precludes clear statements about cause and effect. This point holds even in longitudinal studies that would

support the hypothesis that vigorous exercise leads to beneficial mental health effects.

Citing a NIMH workshop that used a strictly limited criterion for selection of statements about exercise effects, Morgan and O'Conner (1988), list findings about the influence of exercise on mental health. These findings use carefully stated points to summarize what can be stated about the positive effects to be gained from exercise/fitness training:

1. Physical fitness is positively associated with mental health and with well-being.
2. Exercise is associated with the reduction of stress emotions such as state anxiety.
3. Anxiety and depression are common symptoms of failure to cope with mental stress, and exercise has been associated with a decreased level of mild to moderate depression and anxiety.
4. Long-term exercise is usually associated with reductions in traits such as neuroticism and anxiety.
5. Severe depression usually requires professional treatment, which may include medication, electroconvulsive therapy, and/or psychotherapy, with exercise as an adjunct.
6. Appropriate exercise results in reductions in various stress indices such as neuromuscular tension, resting heart rate, and some stress hormones.
7. Current clinical opinion holds that exercise has beneficial emotional effects across all ages in both sexes.
8. Physically healthy people who require psychotropic medication may safely exercise when exercise and medications are titrated under close medical supervision. (p. 95)

The exercise effect is thus shown to be dependable, applicable to a wide variety of persons, and amenable to use at the same time as other forms of treatment.

Peoples' perceptions about the benefits of a regular program of exercise are equally as important as the

documented benefits. As will be seen in the discussion of the components of the Health Belief Model, perceptions are an important aspect of beliefs. In a study in which people were polled about various forms of behavior they performed to "protect, promote, or maintain . . . health", Harris and Guten, (1979) found that exercise behavior was cited the third most often--behind nutrition and sleep--as one of the "three most important things that you do to protect your health." (p. 21). The important distinction here was that the researchers recorded what behaviors the respondents considered important for health protection, versus a list of behaviors that clinicians perform or would recommend. The level of utilization of health protective behaviors held even when health condition of the respondent varied from good to poor, with the emphasis shifting from self-initiated lifestyle choices like diet and exercise to utilization of the health care system.

Exercise Adoption

The phenomenon of exercise adoption may be patterned after an area of research that provides a basis for measurement and interpreting observations. Prochaska and DiClemente (1983) have developed a theory of behavior change which describes a person's movement through a series of psychological/behavioral stages, resulting in several different outcomes. In their work developing this stage theory, Prochaska and DiClemente (1983) have focused

primarily on the cessation of undesirable behaviors, such as smoking cigarettes.

As specified in their schema, a person's initial step in the change process is from an immotive or precontemplation stage to a contemplation stage. Using cognitive/affective reevaluation of their situation and behavior, the person is compelled to move to an action stage, changing actual behavior. Should the target behavior change be long term and durable, with accompanying cognitive and behavioral changes to support the target behavior, the stage entered into is that of maintenance, where the behavior is ongoing and maintained at a stable level. If behavior drops below the minimum specified level of change, the person drops into the relapse category, wherein the attempted behavior change is abandoned for a period of time. The period may be brief or extended, depending on the determination and resources of the changer toward renewing the effort at change. As will be detailed below, the relapse outcome is fairly common in behavior change projects.

Employing the Prochaska and DiClemente (1983) schema in the context of exercise underscores the need for differentiation of adoption from adherence, which, as generally employed by exercise researchers, includes only the maintenance stage of the process. This stance excludes other important and universal features of human attempts to change behavior that are noted in a broader view of

change. The stage process as used in early studies applies whether the change is self-initiated or prescribed by other parties. At present the terms adoption and adherence are often used interchangeably to refer to success or failure to adhere to a program of exercise begun for any reason, with many of the cognitive factors and much personal history not taken into account.

Dishman (1988) notes the confusions inherent in the current terms being used in behavioral science to describe the exercise adoption process. He observes that compliance and adherence are often used to describe the same phenomena, yet are not generally recognized in catalogues of psychological literature by definitions that conform to their current utilization. He proposes employing the term adherence as a general descriptor in the area of exercise, to include the area of compliance. This comes closer to meeting current needs and recognizing the entirety of the exercise adoption process, yet the early stages of a self-initiated change can be omitted by this term as well. Too, other researchers explicitly link the terms compliance and adherence (e.g. Oldridge, 1981), serving their own needs in investigating exercise treatment programs, but excluding important population groups of exercisers and parts of their experience in entering into an exercise program.

The research on compliance to exercise programs addresses situations that are primarily prescribed behaviors in response to a stimulus situation like obesity or high blood pressure. The focus of compliance research has been on practitioner behavior and characteristics of the setting, with the interaction between client and health care provider the main interest (Becker & Maiman, 1980; Janz & Becker, 1984). Research in compliance assuredly does include individual characteristics, providing the overlap and confusion of terms alluded to above.

Examination of the research findings shows by illustration some of the phenomena to be anticipated in research on exercise adoption. A finding that has results useful for the issue of self-change of habits is the comprehensive study carried out by Perri and Richards (1980). The study compared people who had carried out successful self-change programs with those who had attempted unsuccessful ones, in an attempt to determine what personal characteristics or strategies differentiated the two outcomes. Important indicators emerged for those undertaking self-change programs or working with those who do. Successful self-changers appear to be intuitively skilled at behavioral technique, employing self-reinforcement and persisting far longer in their attempts than did unsuccessful changers. Of note for the present study was the recommendation that persons

undertaking self-change programs insure that their program is comprehensive in nature and should involve a number of individually tailored procedures.

Some research (Sonstroem, 1987; Ward & Morgan, 1984) has been performed using the stage schema applied to exercise. Ward and Morgan appear to be the first to apply the stage theory of change to exercise, finding that adherence at 10, 20, and 32 weeks in an exercise program was predicted by different sets of variables. Using the Theory of Reasoned Action (Ajzen & Fishbein, 1977) as a basis for a beliefs investigation, Sonstroem related the belief constellation to a reduced number of the Prochaska and DiClemente stages. He termed the process exercise adoption, although without providing a rationale for the use of that term versus the others available. The main body of work cited in his review of the theoretical bases for his research, he notes, does include subjects who were seeking to change on their own. As the term "exercise adoption" is rarely used, the more widely held "adherence" term will apply through most of this review.

Factors in Adherence to Exercise

Exercise adherence is examined from many different perspectives, with each providing information to compose a picture of someone in the exercise adoption process. Some studies examine the factors associated with dropout, where others test for personal characteristics associated with a

successful, continued exercise program. Perhaps one of the most complete recent studies on exercise adherence was the collection of researches reported by Martin et al. (1984). The series was designed in an attempt to isolate factors that affect the outcome of exercise adoption attempts by sedentary adults. The investigators' main interest was in determining the efficacy of various cognitive-behavioral procedures in support of exercise programs begun by people attending a community exercise program. Dividing 143 subjects into six treatment conditions allowed the researchers to test for the effectiveness of different elements of behavioral techniques.

Each treatment group that began a running program received differing combinations of cognitive-behavioral strategies for the three months of the program, apart from a common structure utilized by all groups. For each group an "ideal" strategy was included, with the ideal based on the past observed efficacy of each element. In Group 1, the ideal was personalized feedback, distance goals (for running), and fixed goals. Each group provided varying combinations, allowing the researchers to compare group and personalized feedback; time and distance goals; flexible and fixed goals; distal (long range) and proximal (short range) goals; and associative versus dissociative cognitive strategies.

Analyses of variance and t-tests were used to test for significant differences between conditions within

groups. Many of the variables investigated proved a positive influence on the ultimate adherence of the subjects beginning exercise programs. In particular, social support, personal feedback/praise, flexibility in goal setting, and distraction-based cognitive strategies proved most effective in increasing rates of adherence. No advantage was seen for time versus distance goals.

Impressively, overall adherence at the end of the three months, for all subjects in the study, varied from 80-85 percent. This was considerably better than the 55 percent adherence usually observed for this time period in an exercise adoption group program (Martin et al., 1984). Of interest here is the fact that 49% of the subjects in the study had previously attempted an exercise program. No differentiation of these "relapsers" from the subjects beginning exercise for the first time was attempted. Martin et al. (1984) also found class attendance and self-report of exercise participation to correlate significantly with "post" measures of fitness.

Another study illustrating recent methods used to scrutinize exercise adherence is one by Dishman and Gettman (1980) that examines many different psychobiologic influences on ultimate adherence. The study used physiological measures such as weight and percent body fat along with psychological measures designed to measure attitudes toward and valuing of exercise. A prospective

study with 66 subjects, it used subjects that were beginning exercise programs for the first time, combining healthy exercisers with coronary heart disease rehabilitation subjects. The outcome of the entry into an exercise program was labeled as either adherence or dropout, with anyone not participating at the end of the 20 week period of the study labeled a dropout.

Using stepwise multiple regression, three variables of the ones measured were found to significantly enhance the prediction equation for adherence: 1) body fat percentage; 2) a measure of self-motivation; and 3) body weight. Taken together, these three variables accounted for 45 percent of the overall variance and provided for predicting adherence/dropout category in 79 percent of all cases examined. The authors chose only one other independent measure in addition to their own on self-motivation, that of the health locus of control (Wallston, Wallston, Kaplan, & Maides, 1976). The other scales were subscales of the Attitude Toward Physical Activity scale or the Physical Estimation and Attraction scale. The ability of these subscales to contribute to a prediction of subsequent exercise status may have been compromised by their application within this study as stand-alone variables.

In a study examining the long-term rates of adherence for a population of male and female victims of myocardial infarction, the investigators found only 18.7% remained at

the end of a forty month period (Carmody, Senner, Malinow, & Matarazzo, 1980). Two hundred and six subjects were followed up at four month intervals to see which remained active in a prescribed exercise program. In the initial four month period dropout was 30%, with the subsequent rate of dropout reduced in each followup after the initial period. This pattern duplicates the typical finding for relapse/dropout in habit-change studies (e.g. Dishman, 1988), with the dropout rate somewhat greater than that of a general population. Studies of this duration are rare, so comparison is difficult. This is nonetheless a surprising finding, given the explicit urgency attached to the successful adoption of the exercise prescription for this group.

Summarizing findings in a chapter reviewing studies on adherence to post-myocardial infarction exercise regimens, Oldridge (1981) identified some common characteristics that tended to be associated with dropout. The research reviewed focused primarily on the characteristics of the enrollees, omitting formal measures of their psychological or physical states. A profile constructed using characteristics that recurred across studies shows that a dropout is likely to be a blue collar worker, to be inactive physically in his leisure time, to be a smoker, and to have had more than one previous myocardial infarction. The mechanisms whereby these

characteristics contributed to the outcome of dropping out were described by Oldridge as being unclear. Some of the subjects' negative evaluations of the programs in which they were participating included statements like "difficult to perform," "dislike physical training," or "aversion to the hospital".

Franklin (1978) investigated the factors affecting exercise adherence in fitness programs for both healthy adults and patients in rehabilitation programs. Although the analysis focused primarily on individual physical characteristics, fitness level, and behavioral regimens, motivation was mentioned as a main personal factor to be addressed. Franklin's suggested solutions to motivational deficits focused on the structure and form of the exercise itself rather than directly on psychological factors. Program features associated with dropout were lack of encouragement for clients, client injuries incurred while participating, individual participation versus group programs, inadequate instruction, and absence of regular updating of clients on progress made. Other client features cited as factors were presence of support from spouse or peers and a convenient time schedule for involvement in exercise.

A prospective study that followed 106 subjects for a total of six months was conducted by Gale, Eckhoff, Mogel, and Rodnick (1984) to determine factors that could be associated with exercise adherence. Many measures were

taken of physiological characteristics, self-motivation, demographic descriptors, health related behaviors, and previous involvement in exercise. Subjects were healthy adult men and women; 18% dropped out before attending 10% of the classes, 40% attended between 10 and 40% of the classes, and 42% attended more than half the classes. Factors were examined for correlation to adherence.

Findings were disappointing given the array of related factors that were examined. Only one of the factors (marital status) was significantly correlated with adherence to the program of exercise, and the two factors with the highest predictive value were the number of years in present occupation and number of years at present address. Indicators of less stability of overall life were associated with early dropout; features such as being single or being only a couple of years at present address or job. The other variables that distinguished between categories were self-motivation and number of children. Discussing the puzzling results, the authors speculate that the dropouts in their study may have continued to exercise away from the program, or that they may have not found the program to be engaging or challenging enough.

Investigations attempting to identify specific personal factors affecting adherence to exercise sometimes yield results in unexpected directions. An example is research cited above by Dishman, Ickes, and Morgan, (1980)

to verify the concept of self-motivation as an explanatory mechanism for differential outcomes for people beginning exercise regimens. Their findings found their construct of self-motivation to be significantly associated with adherence to an exercise program; it also found the most important factor affecting adherence to be percentage of body fat. The higher the percentage of fat (and the greater the weight) the more likely the person was to drop out of the exercise program. Although self-motivation was one of the three factors that reached significance in distinguishing between adherers and dropouts, this finding illustrates the way in which many different--and sometimes unexpectedly prominent--biopsychosocial variables affect behavior.

As an aside in surveying factors affecting adherence/compliance, Dishman (1982) notes the importance of taking into account those who may drop out of the formal exercise program under study, but continue to exercise on their own or in another program. Dishman also cautions against losing research information by dichotomizing the population into adherers and dropouts, to the exclusion of the large class that does succeed in participating in an alternative pattern of exercise.

In the above pair of studies Dishman, Ickes, and Morgan, (1980) and Dishman and Gettman (1980) advanced the concept of self-motivation as an explanation for differential outcomes in people beginning exercise

regimens. They dismiss the role of attitudes or beliefs, positing a weak or absent relationship. Godin and Shepard (1986) have responded with the observation that the problem may lie with the method. They reply to Dishman and Gettman (1980) with the assertion that the need is for theory-driven research to test models, versus the "shotgun" approach of associating variables with outcomes and claiming some degree of relationship. For them the questions to ask are "when" and "how": when is there a relationship between attitude and behavior, and how is the effect of an attitude on behavior mediated? Sonstroem (1982), acknowledges the utility of self motivation, but notes that its classification as a trait places it outside the area targeted by research into modifiable psychological factors. As will be seen below, many theorists working with the Health Belief Model believe motivation is determined by the constellation of beliefs held by persons in relation to certain pivotal areas of their lives.

Powell (1988) summarizes factors affecting exercise adoption in table form, collecting together potential "determinants of physical activity" as an illustration of the scope of the problem facing those seeking to identify the specific factors having an impact on adherence to exercise. The determinants come from a compilation of past research done to identify the most important and most

salient influences on an exercise adoption effort.

Although research results in the exercise adoption area are far from conclusive, the list of factors is instructive:

Personal characteristics--Past program participation; past extraprogram activity; school athletics, 1 sport; school athletics, >1 sport; blue collar occupation; smoking; overweight; high risk of coronary heart disease; type A behavior; health, exercise knowledge; attitudes; enjoyment of activity; perceived health; mood disturbance; education; age; expect personal health benefit; self-efficacy for exercise; intention to adhere; perceived physical competence; self-motivation; evaluating costs and benefit; behavioral skills.

Environmental characteristics--Spouse support; perceived available time; access to facilities; disruptions in routine; social reinforcement (staff, exercise partner); family influence; peer influence; physical influences; cost; medical screening; climate; incentives.

Activity characteristics--Activity intensity; perceived discomfort. (Powell, 1988, p. 27)

Powell's list bears some striking similarities to a similar group of factors identified as having an impact on treatment adherence behavior (Meichenbaum & Turk, 1987). Many of the above findings on adherence to exercise may also be found in their assemblage of factors affecting compliance with treatment regimens. Powell's list is a good tool for guiding research on exercise adoption, in that it reminds the researcher of potential limitations to the conclusions drawn from research on any one variable. Given this caveat, another finding that may be noted is the number of items on the list that will have

representation in some form in a Health Belief Model investigation targeted on exercise behavior.

The Health Belief Model and Its Role in Behavioral Research

The Health Belief Model was developed in the early 1950s in an attempt to understand individual differences in the practice of preventive health behaviors, first in regard to asymptomatic diseases, later in an expanding number of disease states, venues, and situations. The roots of the Health Belief Model lie in social psychology, specifically the work of Lewin (1935). Rosenstock (1974a) identifies the main orientation of the early researchers as phenomenological, centered on the world of the perceiver as opposed to the actual physical world. It was this foundation that led to the formulation of a model detailing different personal "fields" that were believed to affect subsequent motivation and thus behavior.

In an explication of the function of personal fields, Rosenstock (1974a) puts the origin of motivation as toward positive fields and away from negative ones. Persons operating within these fields would thus move away from those areas of their lives that were perceived as negative and toward those parts that were valued as positive. The components of the model represent a conceptualization of the fields likely to be identified as affecting decisions about behavior having an impact on health.

In one of the earlier theoretical writings detailing the roots of the Health Belief Model, Suchman (1970) elaborated on the role of perception and interpretation in the etiology of illness. He notes, "People do not perceive the world as it actually is but as they have become accustomed to perceive it" (p. 107). In his conceptualization of the motivation to change behavior, the facts matter less than one's perceptions in making choices.

Three levels of influence guide the perceptual process in Suchman's view of individual and social behavior: the anthropological/cultural, the sociological/group, and the psychological/individual. Each level shapes the resultant attitudes and beliefs, thus the behavior. "Motivation to change one's health practices depends, to a large extent, upon the individual's feelings of personal vulnerability and the seriousness with which he views the health hazard." (Suchman, 1970, p. 109-110). It is thus possible to see the scope of the challenge if one thinks in terms of behavior change interventions, as the focus is not just factual information but the particular beliefs the individual has about the world.

Becker, Maiman, Kirscht, Haefner, & Drachman (1977) argue that the Health Belief Model is based on a "value-expectancy" approach, wherein behavior is predictable if one knows an individual's valuation of an

outcome and their expectation that a specific action will result in that outcome. Characteristics the authors deem relevant to the formulation of a model utilizing health beliefs include 1) the motivation to avoid illness or to get well; 2) the amount of desire for a specific level of health; 3) the belief that specific actions will prevent or moderate illness or disease conditions. The alignment of components detailed on pages 13 and 14 of Chapter 1 is the grouping commonly studied in Health Belief Model research, and were devised to assess the presence and strength of the above characteristics.

In Ajzen and Fishbein's theory of reasoned action, (Ajzen & Fishbein, 1977) beliefs are considered the cognitive component of the attitude. Kirscht (1974) defines a belief as "any proposition or hypothesis held by a person, relating any two or more psychological elements or objects" (p. 456), while attitudes are posited as collections of beliefs in which there is an evaluative component. Highlighted more within Health Belief Model theory is the evaluative, positive-negative association that the individual has at the belief level. A parallel can be discerned between the process described in the Health Belief Model and attitude-behavior relations, with the outcome, behavior, dependent on collections of attitudes, in turn made up of beliefs.

The attitude-behavior link has received much discussion in social psychology, with lack of consensus

about the role of attitudes in determining behavior (Cooper & Croyle, 1984). Generally accepted are the assertions by Ajzen and Fishbein, (1977) that the specificity of correspondence between attitudes and behavior has a lot to do with the degree of the relationship between the two. That is, a general attitude will predict a multiple-act criterion better than a single-act one, while a specific attitude will predict a single-act criterion better than a multiple-act one. An illustration is the comparison between a general attitude toward health with its resultant health-protective behaviors and a specific attitude about tooth-brushing and subsequent brushing behavior. Recent findings bear out these assertions, with a study using a measure of general attitudes and multiple acts showing a high degree of correspondence between the two (Turk, Rudy, & Salovey, 1984).

Rosenstock (1974b) documents the first application of the Health Belief Model as a study by Hochbaum in 1952 that attempted to identify factors underlying the decision to obtain a chest X-ray for the detection of tuberculosis. This study assessed specific beliefs about the disease of tuberculosis and related them to the decision to seek an X-ray as a mechanism for detection of the disease. Two specific beliefs were measured, one detailing the respondent's belief that they were susceptible to

tuberculosis, the other their belief in the overall benefits of early detection. Those having both beliefs were four times as likely to have received a chest X-ray during a specified period as those who had neither belief. These findings spurred much subsequent research and the delineation of a full model for the organization and identification of individual beliefs.

It was not until the mid-seventies that the structure of the Health Belief Model had stabilized into the form that it has retained to the present. By then it had gained currency as a tool for explaining health behavior, with a review of applications of the model finding a durable pattern to the results of initial investigations (Becker & Maiman, 1975). Examining the testing of the Health Belief Model components, the authors found that the relevant beliefs reliably correlated with behavior. The perceived level of susceptibility was found to correlate positively with the performance of health behavior, which is defined as any action taken by an individual who perceives himself to be healthy in order to prevent the occurrence of disease or detect it in and asymptomatic stage (Kasl & Cobb, 1966). Behaviors ranged from cancer screening to obtaining immunizations to dental visits.

The perceived severity of the conditions to which the individual feels vulnerable was found to have a weak relationship in early reviews of research (Kirscht, 1974; Becker & Maiman, 1975), with some studies finding that a

higher degree of perceived severity predicts participation in dental care, responding to disease symptoms, and working to prevent accidents. No significant correlation of perceived severity with target behaviors was found in many of the other studies, but the authors of the main review (Becker & Maiman, 1975) saw the component as contributing valuable information to the overall predictive value of the model.

The elements of the model found to have the greatest correlation with behavior in these early reviews were the perceived benefits of the health protective behavior being researched and the perceived barriers to or costs of performing that behavior. For the benefits construct, positive, statistically significant correlations were usually found between perceived efficacy of a preventive health action and the performance of that action, including obtaining immunizations, getting screening for cancer and tuberculosis, and seeking prophylactic dental visits (Becker & Maiman, 1975). Similarly, barriers/costs were found to be inversely associated with involvement in preventive behaviors. Barriers identified as likely to interfere with carrying out behaviors were monetary cost, complexity of the regimen, side effects, degree of change needed, and accessibility of facilities. The health motivation component of the Health Belief Model was

proposed in 1975 (Becker & Maiman, 1975); results of later investigations will be reported below.

A survey of research utilizing the Health Belief Model found sufficient evidence to uphold the components as distinct, separate areas of beliefs and as having significant correlation to many differing areas of behavior (Becker, Haefner, et al., 1977). This survey systematically examined each study for evidence of significant associations between qualities assessed by the components and subsequent behavior in both the preventive and sick-role realms. Both the preventive behavior studies and the sick-role studies used prospective and retrospective designs.

A total of twelve preventive behavior studies were evaluated. The behaviors being examined included seeking dental visits, getting Pap tests, getting polio vaccinations, getting examinations for a number of different potentially harmful conditions, and getting screened for Tay-Sachs disease. The authors noted the number of studies that reported results for each component of the model, allowing construction of a "significance ratio". This ratio compared the number of times a significant correlation of beliefs with behavior was found with the number of times it was tested, with significance set at the .05 level. For perceived susceptibility, the ratio was 9 out of 10; perceived severity, 6 out of 8.

With the constructs of perceived benefits and barriers, the ratios were 6 out of 9 and 3 out of 4, respectively.

Seven sick-role studies were charted in the same manner, showing that each reported result achieved significance for the four components. The behavior focus in these studies was primarily penicillin prophylaxis or regimens recommended as a result of findings of disease, with one study investigating use of followup care after a negative health finding. Perceived susceptibility was examined in three of the studies, with perceived severity targeted in four. For perceived benefits the number was four, and perceived barriers, one (Becker, Haefner, et al., 1977).

A research team performed a study assessing Health Belief Model component beliefs specific to compliance issues, in an attempt to explain the different responses of low income mothers of children with otitis media (Becker, Drachman, & Kirscht, 1974) Their work was successful in differentiating compliers with medical regimens from non-compliers, as measured by a complex behavioral protocol. The study was intended as an initial step in a program to improve compliance through changing health beliefs. While the composite model was found to be a better predictor, their conclusions stated the aim of such research in behavioral change "Thus, by knowing which model components are below a level presumed necessary for

compliance, the health worker may be able to tailor intervention to suit the needs of the individual."

(Becker, Drachman, & Kirscht, 1974, p. 215). Although the focus in the current study is on self-initiated changes as opposed to compliance, the mechanism of action of beliefs upon behavior was expected to be the same.

Cues to action, a belief construct that was part of the original formulation of the Health Belief Model, has proven to be difficult to research. Cues are hypothesized as stimuli or events that trigger the individual to act once the other model components have provided the motivation and direction of the action. Cues may be internal, such as perceptions of bodily state, or external, encompassing many different kinds of messages from media or significant others. Health Belief Model researchers had early general agreement about their importance to the outcome of a behavioral intention.

After some attempts to identify salient cues in investigations of Health Belief Model factors, the conclusion reached by one of the originators of the component was that most settings preclude obtaining an adequate measure of the contribution of this variable to behavioral outcomes (Rosenstock, 1974a). Without some way of recording the cues as they occur in the life of each subject, (e.g. chest pain, or a public health poster about the need to seek vaccinations) too much is lost when asking for recall of relevant, possibly related cues. This

construct quickly faded from the Health Belief Model research method. With the development of new tools and methods for adequate measurement of cues in future researches, the variable may well be revived as a relevant part of the Health Belief Model.

When Health Belief Model components were compared to other explanatory models of health behavior, many of the common elements among the models turned out be wholly or in greater part contained within Health Belief Model factors (Cummings, Becker, & Maile, 1980). The six subsuming factors found to be organizing elements for the theories examined in the study were: 1) accessibility to health care, 2) evaluation of health care, 3) perception of symptoms and threat of disease, 4) social network characteristics, 5) knowledge about disease, and 6) demographic characteristics. Thus the Health Belief Model has links with the breadth of health behavior research, with the only major omission of the model being a part that explicitly addresses social network characteristics. In that category, it appears that descriptors of such characteristics would fit in the benefits component of the model.

Studies incorporating the Health Belief Model have proliferated following the initial evaluative research of the seventies (e.g. Cummings, Jette, & Rosenstock, 1978) with many different applications developed and

investigated. Although the methods used became more sophisticated, the tendency for each researcher to use instruments specific to their own studies continued. This practice resulted in refinement of statistical technique to be applied in this kind of research, but made comparative conclusions difficult because of the differences between instruments or constructs. This trend has been bemoaned by researchers centrally involved with the Health Belief Model, (Janz & Becker, 1984) but the pattern continues even in the most recent research.

A major shift has occurred in the area of application of the Health Belief Model, toward investigating preventive behaviors and with a corresponding lessening of concern with sick-role behaviors. The first use of the methodology in connection with exercise was in 1980 (Riddle, 1980), with most intervention studies using the Health Belief Model having been performed primarily in the past decade. A close examination of them follows.

Illustrating the durability and continued utility of the Health Belief Model methodology is a study by Chen and Tatsuoka (1984) that measured the impact of beliefs on preventive dental behavior. Preventive dental behavior includes dental visits, brushing, and flossing of teeth. Patterned after early, similar research, the study used canonical correlation, a measure of association especially appropriate for evaluating the degree of contribution the Health Belief Model components make in predicting

different preventive dental behaviors. Conducted using 685 married Caucasian women as subjects, the study assessed beliefs and behavior simultaneously in a cross-sectional design, using a questionnaire format. Overall success or failure to engage in preventive dental health behavior was significantly related to health beliefs ($r_c=0.436$, $P \leq 0.001$). Among the separate Health Belief Model components, the ones having the greatest predictive value with preventive dental behavior, as measured by structure coefficients, were perception of barriers and perception of benefits. Another element highly predictive of behavior was a construct examined in the study by Chen and Tatsuoka (1984), perception of salience of beliefs. Much lower coefficients were obtained for perception of susceptibility and perception of severity.

The study by Chen and Tatsuoka (1984) is representative of the method and general findings in modern Health Belief Model research. The perceived barriers component appears to be the construct of the Health Belief Model holding the strongest association with preventive behavior, as measured by findings of significance in Health Belief Model investigations (Janz & Becker, 1984). General findings differ from the dental study in that perceived susceptibility was the second strongest association overall, with perceived benefits third.

One of the limitations of the Health Belief Model has been that a causal relationship between beliefs and subsequent behavior has been difficult to establish (Cummings, Becker, & Maile 1980). This difficulty arises from the need to apply the theory using knowledge about the population, about the setting, and about the specific behavior under investigation. Isolating the relationship of a particular personal feature such as beliefs to a behavioral outcome is made difficult by natural limits on the amount of information obtainable about person-environment interactions. Thus, statements about the variables examined in Health Belief Model investigations have typically been couched in terms of correlations and coefficients, with some few studies able to draw limited conclusions about causality based on controlled interventions.

The most comprehensive assessment of Health Belief Model research that has been performed since the model was organized as a foundation for investigating health behavior was that of Janz and Becker (1984). The authors note many empirical findings supporting the ability of all the model components to achieve significance as explanatory and predictive mechanisms. Even the component of the model found to be suspect in its utility in earlier reviews, that of perceived severity, was upheld as a valid and reliable measure throughout its many contexts of

application. As a model, the Health Belief Model has shown more activity and corroboration than any other model addressing health-related behavior. Within this framework, assessing the role of beliefs in mediating or determining health behavior has been a primarily retrospective, cross-sectional undertaking.

Researchers' limited resources continue to hinder studies thorough enough to enable firmly ruling out competing or confounding explanations with some of the model components, but a solid base for ongoing research and applications within the health professions has been established. Longitudinal studies that would allow firmer statements about causality are costly, with few occurring in such beliefs research. Prospective studies that have been performed have shown levels of significance comparable to retrospective studies, showing promise for this method of research on the Health Belief Model (Janz & Becker, 1984).

Experimental studies based on the Health Belief Model have shown the impact of health beliefs on behavior to be a useful, potent phenomenon in behavior change manipulations. Interventions using Health Belief Model components as a basis for determining the degree of change in beliefs have met with success. Using beliefs change as the mechanism to change certain target health behaviors,

researchers have documented subsequent differences in the level of the target behavior.

In a study investigating the effect of health threat communications on preventive dental behavior, Beck and Lund (1981), assigned subjects to four groups. Each group got an educational slide show about periodontal gum disease with a stated level of susceptibility to the disease (high or low) and the alleged severity of the disease if it were to occur (again high or low). This assignment process formed four cells of different combinations of communications, allowing the experimenters to assess the impact on subsequent beliefs, flossing intentions, and flossing behavior. Patients who had a higher level of perceived seriousness of gum disease as a result of viewing the communication subsequently increased in their intention to floss as well as their actual frequency of flossing, showing significant differences from the low perceived seriousness group. Patients with high susceptibility were more likely to floss more often, though the differences were not significant.

Other investigations have demonstrated the efficacy of interventions designed to affect peoples' health beliefs and thus behavior. A major review study about research on the modification of beliefs and thus behaviors (Kirscht, 1974) found many efforts to utilize the situational and behavioral specificity of the Health

Belief Model in devising experimental regimens. Most of the studies reviewed used communications to heighten threat or arouse fear on the part of the recipient, based on the premise that the resulting higher degree of perceived severity or perceived susceptibility would result in a greater likelihood that the behavior would change as a result. Results were complex, as might be expected in a multivariate model, but generally supported both the Health Belief Model and the effectiveness of the change regimens. Important mediating effects found to have an impact on the results were the presence of a response option perceived as effective in reducing the threat and other beliefs about the new behavior.

In a test of the effects of interventions targeted on behavior change, Becker, Maiman, Kirscht, Haefner, and Drachman (1977) performed a study in which mothers of overweight children were exposed to fear-arousing communications based on Health Belief Model dimensions. Measures of subsequent appointment-keeping and childrens' weight loss showed both significant independent effects of the fear-arousing messages and significant correlations of the Health Belief Model variables with the behaviors. This experiment demonstrated the usefulness of the Health Belief Model as a whole through several multiple regressions, along with demonstrating that the influence

of the fear-arousing messages was independent of the impact of beliefs.

Kirscht (1983) reports mixed results later from Health Belief Model investigations utilizing belief-change interventions. An outcome of adoption of the target behavior depended, generally, on the simultaneous presence of perceived susceptibility and severity, and on the behavior in question being perceived as beneficial and with few accompanying barriers or costs. Thus, the employment of the Health Belief Model in devising strategies for behavior change through persuasive communications requires the recognition that all the components play a role in the final outcome. A narrow focus utilizing only one component is susceptible to misapplication and misinterpretation of the results. When correctly utilized and with an appreciation for uncontrolled variables, interventions based on the components of the model appear effective in altering behavior. Kirscht (1983) cautions that too few studies exist that have examined long-term changes in behavior for definitive conclusions to be possible.

Applying the Health Belief Model to the Exercise Adoption Problem

The Health Belief Model has proven to be a successful tool for predicting the likelihood and frequency of many different kinds of preventive health behaviors. Another potential application receiving increasing research

attention has been in evaluating the effectiveness of model-based interventions designed to positively affect personal behavior patterns. A tool for explaining, predicting, and changing health-related behaviors offers potential utility in the specific case of aerobic exercise. The need for mechanisms to support exercise adoption is easily documented. In a review of exercise participation, Powell (1988) found that only 9% of the population in the U.S. exercises at the level necessary to derive the benefits exercise has to offer.

Current patterns in exercise research show widespread use of the findings of the American College of Sports Medicine (1978) on the minimum level of exercise necessary to develop and maintain fitness. These guidelines specify the following parameters for exercise quantity and quality: 1) frequency of training 3-5 days per week, 2) intensity of training 60%-90% of maximum heart rate reserve, 3) duration of training 15-60 minutes of continuous aerobic activity, with duration dependent on intensity, and 4) a mode of activity that involves large muscle groups, that can be maintained continuously, and is rhythmical and aerobic in nature (American College of Sports Medicine, 1978, p. vii). Given the almost universal employment of all or parts of these guidelines in fitness programs and in evaluative research, the current study was formulated to examine the association of Health Belief

Model variables with exercise conforming to the American College of Sports Medicine parameters.

With a 50% dropout from aerobic exercise programs at six months (Dishman & Gettman, 1980), clearly a reliable regimen for assisting exercise adoption would play a useful role in such programs. The utility of such a program would apply whether the target was an individual or a group, whether the exercise adoption goal was self-motivated or prescribed. The development of such a regimen is dependent on adequate knowledge of what changes are being attempted. Dishman (1988) has observed, "one barrier to implementing public health promotions of exercise as well as uniform interventions in exercise programs is the absence of a consensus over the methods that might be effectively employed and the exercise determinants to be targeted" (p. 2). Research on exercise adoption must contain attempts to identify the key determinants and begin to apply them in experimental trials to determine their utility in effecting change.

Hughes (1984) cites the need for more research to identify relevant characteristics of individual exercisers and to identify the best method to prescribe exercise as treatment. Such a base of knowledge is needed to develop the method for prescribing exercise as well as the best ways of insuring positive outcomes once the program has been undertaken. The need to take into account individual factors affecting exercise adoption, and the challenge

therein, was cited in discussion of a recent attempt to isolate factors influencing exercise adherence (Gale, Eckhoff, Mogel, & Rodnick, 1984). The authors noted the complexity and the difficulty in distinguishing different individual characteristics while controlling for other factors, observing that the phenomenon of adherence is likely the product of interaction between personal and program characteristics. Along with many other writers in the exercise adoption area, they cite the need for much more research in this area before a reliable program for change can be developed.

As regards exercise and other forms of preventive health behavior, calls for more research on social and psychological predictors of health-related behavior have appeared in different quarters, emphasizing the paucity of experimental research that could provide the foundation for programs of change (McAlister, Farquhar, Thoresen, & Maccoby, 1976; Becker, Haefner, et al. 1977). For the example of aerobic exercise, additional steps are needed to identify specific beliefs (and the degree to which each are held) that are associated with successful and unsuccessful attempts at exercise adoption. A reliable method for determining relevant beliefs would provide for the development of effective psycho-educational and belief change regimens to augment the known precursors of behavioral change.

An antecedent of the current interest in the possible contributions of the Health Belief Model to the explanation of and support of exercise adoption behavior was contained in an earlier discussion of the mechanisms of the model:

Surely, the exercise and dietary mania observed over the last decade represent behaviors that could be regarded as striving toward improved health, but it is just as easy to explain them (insofar as they are health related at all) as behavior undertaken to avoid a deleterious situation. Again, there are individuals who exercise and engage in other health actions having health implications but who do so for reasons quite unrelated to health, perhaps for aesthetic reasons or for the sheer exhilaration felt by many by the performance of physical work. Again, the question of whether the avoidance orientation in the Health Belief Model is adequate to account for the so-called positive health actions taken by people remains unresolved.

(Rosenstock, 1974a, p. 335)

Although written some time ago, the uncertainty voiced in the discussion remains today, with only a few exploratory efforts having been undertaken to answer the questions raised. Such research serves as the foundation and guidance for specifying elements of the present study.

Reviewers of recent research have verified the relationship of beliefs and attitudes to intentions to exercise and the exercise behavior itself (Godin & Shepard, 1986). In examining research up to now in the area of exercise behavior, Godin and Shepard support the theory of Ajzen and Fishbein (1977), noting that recent attitude-behavior research has already proceeded from "is" questions (Is there an effect?) to "when" and "how"

questions. The second brace of questions, when answered, will provide information about when there is a relation between attitude and behavior plus how the effect of attitudes on behavior is mediated. Godin and Shepard (1986) lobby for the application of theory to this problem as opposed to the "shotgun" approach of trying out variables in varying combinations.

The authors who have stimulated much of the recent interest and activity in attitude-behavior work did so by distilling and thematizing much of the research that had occurred up to the time of their extensive review (Ajzen & Fishbein, 1977). Of particular interest was the finding, cited above (pp. 53-54), about the patterns of correspondence between attitudes and behavior. The result has been studies that test the relationship in specific, particular instances of behavior as well as the more global, broad questions. Exercise provides the opportunity for both kinds of research, from the likelihood of doing a particular form of exercise at a particular time to general adherence over time.

Riddle (1980) devised a test of attitude-behavior relations for a particular form of exercise--jogging--and utilizing one of the main models of the relationship between attitudes and behavior. Choosing Fishbein's Behavioral Intention Model, she developed a beliefs measure using an elicitation technique that resulted in a

68 item measure. With the criterion behavior identified as regular jogging, the survey assessed behavioral intention, attitude toward behavior, attitude toward the object, subjective norms for behavior, motivation to comply, consequences of behavior, and evaluation of the consequences. The focus of the study was on testing the validity of the Behavioral Intention Model, but clearly the Health Belief Model methodology served as a guide in the construction of the beliefs items on the survey. The survey was administered to 369 men and women of age 30 and over, with 296 usable surveys received. Joggers numbered 149, non-exercisers totalled 147.

Results of the research, confirmatory of the Behavioral Intention Model, also showed marked belief differences between joggers and non-exercisers. Riddle (1980) documented differences between joggers and non-exercisers on beliefs corresponding to two Health Belief Model dimensions, perceived benefits and perceived barriers. On 17 of the 19 belief scales, differences between joggers and non-exercisers on the benefits/barriers items were significant at the $p \leq .001$ level. The items were structured as follows: "Taking part in regular jogging in the next two weeks would...". Examples of the items showing significant differences are: "make me feel too tired," "take too much time," "make me feel good mentally," "make me have a fatal heart attack/stroke." Beliefs about the consequences of exercise

in the form of regular jogging accounted for much more of the variance than did evaluation of the consequences. Joggers had strong beliefs about the positive consequences of jogging, while nonexercisers had neutral beliefs about the positive and negative consequences. Joggers thought regular jogging would benefit their physical and mental health, while non-exercisers thought it would require too much time and discipline and make them too tired.

In another study utilizing techniques suggested by Fishbein's Behavioral Intention Model, Slenker, Price, Roberts, and Jurs (1984) established a promising precedent for the employment of the Health Belief Model with regard to predicting aerobic exercise adoption. Their investigation applied the model in a specific exercise situation, that of jogging. An instrument was developed and validated for purposes of measurement of beliefs specific to expectations about jogging, for the five customary belief areas examined in Health Belief Model research: perceived benefits, perceived barriers, perceived susceptibility to disease, perceived severity of possible disease conditions, and general health motivation. Other variables under investigation were also part of the instrument, including knowledge about jogging, complexity of jogging, cues, and health locus of control. The completed instrument was administered to 40 joggers and 39 nonexercisers.

A composite regression analysis of Health Belief Model variables that included one other variable accounted for 56% of the variance in jogging behavior. The Health Belief Model variables of perceived benefits, perceived barriers, and general health motivation comprised a multiple R of .707, or 50% of the total variance. The single variable perceived barriers accounted for 40% of the variance. The composite figure was a strong performance of the Health Belief Model variables in explaining exercise behavior. Given the careful instrument development and sound statistical analysis, the finding is one of the most impressive performances of a Health Belief Model-based instrument for any study examined. Using a discriminant analysis procedure, 92 percent of the subjects were correctly assigned to their proper category of jogger or nonexerciser based on the independent Health Belief Model variables assessed.

Similar methods with an adolescent population yielded more equivocal results. The predictive measures produced more modest percentages of correct classification and the amount of variance accounted for by the measure employed for the study was also less (O'Connell, Price, Roberts, Jurs, & McKinley, 1985). Performed on a sample of 69 obese and 100 nonobese high school freshmen and sophomores, the study used the beliefs measures to predict status of obese or nonobese and to predict membership as an exerciser or a

nonexerciser. The beliefs assessed differed from the study performed by Slenker, Price, Roberts, and Jurs (1984) in that measures of social approval for dieting and exercise were added, along with cues for the behavior in question (dieting or exercise). General health motivation was not assessed, while the other Health Belief Model variables--susceptibility, severity, barriers, and benefits--remained. Each of the four variables also obtained a measure of each of the subject's beliefs about the behaviors of diet and exercise.

For obesity, the independent variables employed in the study correctly classified 69% of the subjects as obese or nonobese in a discriminant analysis procedure. The authors observe that obesity is not a behavior, identifying a likely reason for the relatively poor performance of their predictors. When employed to classify dieters versus nondieters, 83% of the subjects were correctly classified. When the discriminant analysis procedure was applied to exercisers versus nonexercisers, 75% of the overall classifications were correct.

The amount of variance accounted for by the independent variables in the case of dieting behavior for obese and nonobese adolescents was 23% and 19%, respectively. For exercise behavior, 14% of the variance was explained for obese subjects, while none of the variables emerged as significant in predicting exercise behavior for the nonobese subjects. These weak findings in

the application of the Health Belief Model to diet and exercise behavior are noted by the authors as an indicator that age may be an important factor in assessing health behaviors using the Health Belief Model. Such an observation is supported by Weinstein (1984), who found that college students have an unrealistically low assessment of their susceptibility to health problems and accidents.

A study undertaken to determine the relationship of Health Belief Model components to compliance with an exercise prescription found that the beliefs of coronary bypass patients played a role in subsequent adherence to a walking exercise regimen (Tirrell & Hart, 1980). Five standard Health Belief Model components were assessed, perceived benefits, perceived barriers, perceived susceptibility, perceived severity, and general health motivation. Using a somewhat abbreviated measure consisting of 19 items, the researchers found that two of the components had significant correlations with compliant behavior, perceived barriers and perceived susceptibility. The correlation of the barriers measure with participation in the "heart walk" regimen was 0.64; with the susceptibility component the correlation was 0.35. The highest degree of significance was achieved with the perceived barriers component, which was significant at the

$p \leq .001$ level; perceived susceptibility was significant at the $p \leq .05$ level of significance.

In a study designed to relate two theories of behavior change, Sonstroem (1987) provides more verification of the role of beliefs in behavior change. Based on Ajzen and Fishbein's Theory of Reasoned Action (1977), the study examined belief statements of subjects with the aim of differentiating between various stages of change as detailed by Prochaska and DiClemente (1983). While the study did not explicitly base the beliefs survey utilized on the Health Belief Model, the categories of beliefs that emerged from the analysis were coincident with the categories utilized in most Health Belief Model studies.

A background questionnaire determined the exercise status of each subject, allowing them to be assigned a category (precontemplation, contemplation, action, maintenance, relapse) in the Prochaska and DiClemente stage schema. Two hundred fourteen respondents were asked to react to belief statements that had been supplied by exercise leaders at various exercise programs. Likert items providing a graded response accompanied each belief statement. Each statement had the root "My participation in a regular program of exercise would:" followed by the statement. Examples of the belief statements are: "help me in controlling my weight"; "increase my cardiovascular

endurance"; "be boring". Principal component analysis on the resulting responses yielded seven usable components, labeled Benefits, Barriers, Novelty Outlet, Social Outlet, Fear, Appearance, and Psychological Gain.

A stepwise discriminant function analysis utilizing the belief findings as a base was constructed to classify the expected Prochaska and DiClemente category for the precontemplation, contemplation, action, and maintenance stages. Mean item responses were computed for each subject for each component, which were then standardized to mean of 50 with a standard deviation of 10. Two functions which accounted for 99.99% of the total Eigen values resulted. The three components which entered the equation were Barriers, Benefits, and Psychological Gain. For the two functions constructed, 60% and 55% of the categories were correctly identified when compared to the subjects' actual status. For research of this type, the percentage of subjects correctly assigned was relatively low. Sonstroem (1987) cites a small sample size in some of the stage categories as a limitation, along with limitations in instrument development.

A survey of research investigating the utility of the Health Belief Model quickly reveals that almost as many different instruments exist as do studies! While there are many idiosyncratic measures that have been employed in beliefs research, there are many parallels between studies, and a consensual choice of method. A consistent

call in reviews of Health Belief Model research, however, is for a standardization of instruments and, where possible, in methods. Little Health Belief Model research is designed to replicate or refine earlier findings, nor are the positive findings that result later employed to design interventions that may provide for support of individuals attempting behavior change programs.

Support for the reliability and validity of properly designed and administered instruments has recently emerged, documenting that such research tools surpass minimum requirements for such measures. A number of studies examining appropriate techniques for constituting and evaluating measures of health beliefs have validated the different beliefs posited for the Health Belief Model as discrete categories that do not overlap. Construct validity for the commonly researched components of the model has been consistently demonstrated, with compelling statistical evidence supporting the independence of the constructs (Maiman, Becker, Kirscht, Haefner, & Drachman, 1977; Cummings, Jette, & Rosenstock, 1978; Jette, Cummings, Brock, Phelps, & Naessens, 1981; Given, Given, Gallin, & Condon, 1983; Champion, 1984). The utility of the combined components of the model in predicting and explaining behavior has already been noted above. An important byproduct of this research activity has been the

development of an item pool where the elements have been found to be valid and reliable.

The most complete test of a single Health Belief Model instrument intended for use in the measurement process was performed by Champion (1984). Designed to verify the validity of scales for use in predicting breast self-examination behavior, the investigation subjected each scale to an internal consistency examination, a test-retest reliability assessment, a test of exclusivity for each scale, and an overall measure of construct validity as demonstrated by the performance of the instrument in predicting breast self-examination behavior. The scales examined included perceived benefits of and barriers to performing breast self-examinations, perceived susceptibility to disease, perceived severity of possible disease conditions, and general health motivation. The final scales used in statistical analysis had between five and twelve items each. The instrument was administered to 301 women of varied ages, education, ethnicity and socioeconomic status.

The five scales had internal consistency reliability coefficients (as determined by computing a Cronbach's Alpha for each scale) ranging from 0.60 to 0.78. Three of the scales had coefficients of 0.76 or higher: susceptibility, severity, and barriers. When test-retest reliabilities were calculated, all the scales except

benefits exhibited coefficients of 0.76 or higher. The author observes that the testing process may have sensitized subjects to the benefits of breast self-examination, making for lower, but still significant, test-retest reliability.

A principal component analysis utilizing orthogonal rotation with a varimax criterion showed the five scales to be mutually exclusive, with only one of the resulting factors having items from more than one of the scales. The severity scale lacked unidimensionality, with distribution of the items from that scale across three factors resulting. When scale scores were used to predict breast self-examination behavior, a multiple R of 0.51 was obtained, accounting for 26% of the variance. The barriers scale accounted for the largest portion of the variance, with health motivation second. The remaining three variables did not account for a significant portion of the variance.

Champion (1984) saw the resulting instrument as a good basis for application with other behaviors, concluding that the method and the model are of sufficient validity for application in many areas. The study represents an important advance in Health Belief Model methodology, providing a useful framework and point of departure in developing a standard procedure for beliefs assessment. Champion assigned importance to the strategy of utilizing previously researched items as a mechanism

for standardizing research results. Evaluative criteria generally accepted as standards in test construction but seldom employed in Health Belief Model investigations are also important elements of the study.

Other studies using similar tests with instruments of like construction report results of similar magnitude. Wagner (1983) found that the Cronbach's alpha reliability coefficients for her Health Belief Model scales ranged from 0.65 up to 0.91, with all but one of the scales above 0.76. Her scales employed Health Belief Model components in ways specific to medical applications that assessed the psychosomatic elements of beliefs and behaviors. Using a factor analytic approach to evaluate Health Belief Model components yielded inconclusive results as to the unitary dimensionality of the usually robust barriers and benefits scales. This appears to be due to the inclusion of a wide range of items representing too many different activities and symptoms.

Another study that also did an evaluative appraisal of an instrument development effort found distinct components and moderate reliabilities (Jette, Cummings, Brock, Phelps, & Naessens, 1981). These results were achieved despite the use of only a few items in each scale. A factor analysis yielded a concordance with existing Health Belief Model constructs of perceived barriers, perceived severity of disease, and concern for

health. These results are of interest given that they were noted in a study that primarily investigated behavior associated with medical regimens. Even without items intended to measure the Health Belief Model components, the factors were identified. Examination of the methodology of instrument construction and use in Health Belief Model studies led to the conclusion that "moderately reliable indices of a wide spectrum of health beliefs can be constructed and replicated across samples." (Jette, Cummings, Brock, Phelps, & Naessens, 1981, p. 92). The authors further note that the obstacles to replicability of results stem from the lack of standardization of instruments and of sufficient rigor in the construction of beliefs measures.

The previously cited study by Slenker, Price, Roberts, and Jurs (1984) (p. 82) also serves as a good foundation for the present study. It found the Health Belief Model to be both valid and reliable in the specific exercise application of jogging. As with the Champion (1984) study, measures of internal consistency and construct validity were applied. The five Health Belief Model scales of perceived benefits of jogging, perceived barriers to jogging, perceived susceptibility to disease, perceived severity of possible disease conditions, and general health motivation achieved KR-20 reliability coefficients of 0.83 or greater with the exception of general health motivation, which has a coefficient of

0.57. Given that the KR-20 procedure is intended for dichotomous variables, it is unclear what a more appropriate analysis would yield in evaluating the components. Factor analysis employing an orthogonal varimax rotation revealed the five constructs to be distinct factors.

Of the possible survey/questionnaire mechanisms for obtaining an accurate measure of an individual's beliefs, the most frequently used method in Health Belief Model research has been the Likert scale. The seven-point Likert method of assessing beliefs has been found to have convergent validity with interview and multiple choice methods of assessment, two other popular assessment strategies. Of the methods compared, the Likert method showed the greatest validity, with zero method effects as opposed to 10% for both multiple choice and interview methods (Cummings, Jette, & Rosenstock, 1978). Likert items have been the assessment method employed in most Health Belief Model studies, with consistent results.

Lau, Hartman, and Ware (1986), performed a study examining the impact of health values on certain health protective behaviors. In a population of university students, those with higher valuing of health were more likely to report doing the behaviors, such as seat belt use, breast self examination, and exercise. Those with higher health-as-a-value scores were significantly more

likely to have done the behaviors than those with low scores. Also, the authors cite an increase in health-as-a-value scores with increasing age within their subject pool. These values stabilized as students moved into adult age ranges, at a level still somewhat lower than in the adult population.

The finding that age is an important factor to be taken into account in the measurement of beliefs and their impact on subsequent behavior corroborates a finding cited above (O'Connell et al., 1985). To avoid confounds in developing instruments and interventions utilizing the Health Belief Model, the use of adults of 25 years of age or older in preliminary studies appears warranted. Age 25 appears to clear by a safe margin the age range where detectable changes in beliefs are occurring.

Hypotheses

The Health Belief Model has shown a consistent capacity for prediction with many different kinds of health behaviors, as well as an ability to account for significant amounts of the variance in retrospective and prospective health behavior investigations (Janz & Becker, 1984). The pattern in the choice and application of instrumentation has been variable, with different methods adopted according to the particular perceived needs of each separate research effort. With the recent spate of research, particularly studies applying the model to the area of exercise behavior, study design has begun to

stabilize into a well-documented and proven methodology with a foundation in accepted assessment practice.

Extending Health Belief Model research into the area of exercise behavior is a step indicated by many other sick-role and preventive health behavior studies, and shows good potential utility for the specific example of general aerobic exercise. No empirically verified, replicable link has been established between the major Health Belief Model components and systematically defined, general aerobic exercise as a dependent variable. No prospective studies have examined the ongoing impact of beliefs in this area. The success of intervention investigations in the area of aerobic exercise depends on the existence of a reliable, repeatable measurement instrument that provides a basis for assessment of effects.

Interaction between beliefs and behavior precludes absolute statements of causality, but repeated measures with a proven instrument provides a basis for first steps in defining the evolution of individual patterns of behavior. As was observed early in the first burst of research activity to use the Health Belief Model, "the hypothesis that behavior is determined by a particular constellation of beliefs can only be tested adequately where the beliefs are known to have existed prior to the behavior that they are supposed to determine" (Rosenstock,

1974b, p. 362). Such findings hang on the existence of a tool with known characteristics and validity to as accurately as possible determine belief constellations specific to the area being researched.

The present study sought to develop and verify the attributes of just such an instrument, with regard to a carefully delineated yet general (many different kinds of exercise) definition of aerobic exercise. Following the evaluation of the validity, reliability, and exclusivity of the constructs, a test of the predictive power of the overall measure over a time period of one month was attempted.

The following hypotheses were advanced:

1. The five Health Belief Model constructs of perceived benefits of aerobic exercise, perceived barriers to aerobic exercise, perceived susceptibility to disease, perceived severity of possible disease conditions, and general health motivation, as operationalized by subscales of the Personal Beliefs Questionnaire, will be found to be reliable when evaluated by computed internal reliability coefficients and test-retest statistics.

2. The five Health Belief Model components, as measured by the Personal Beliefs Questionnaire, will be found to be valid, independent constructs when assessed by measures of intercorrelation and factor analysis statistics.

3. The refined composite of health belief components, resulting from item analysis of the Personal Beliefs Questionnaire and utilizing the five belief components employed in this study, will account for a significant portion of the variance in classification of self-assigned aerobic exercise adoption categories.

4. The refined composite of health belief components from the Personal Beliefs Questionnaire will account for a significant portion of the variance determining class of actual activity/exercise participation as measured by subjects' self-report.

5. The refined composite of health belief components from the Personal Beliefs Questionnaire will successfully predict membership in subjects' self-assigned categories of aerobic exercise adoption.

6. The refined composite of health belief components from the Personal Beliefs Questionnaire will successfully predict membership in classifications of actual activity/exercise participation as measured by subjects' self-report.

7. The refined composite of health belief components from the Personal Beliefs Questionnaire will successfully predict self-reported changes in subjects' exercise status occurring over the period of one month.

CHAPTER 3 METHOD

Subjects

Participants in the study were male and female adult faculty at a mid-size college in central New Jersey. The sample was drawn from a pool of all full-time, on-campus faculty actively teaching during the Spring, 1990 semester. To avoid confounds from maturation effects noted in past investigations with younger populations, (O'Connell et al., 1985; Lau et al., 1986), only individuals over 25 years of age were utilized in the study. A convenience sample of 334 faculty at the college was selected from those in the available pool.

Those faculty members selected were sent a mailing containing a letter describing the study and requesting participation, (Appendix A) a reply/consent form (Appendix B), the "Personal Beliefs Questionnaire" (Gage, 1990; Appendix C), a survey return envelope, and a reply/consent form return envelope. One month following receipt of each subject's response to the first questionnaire, a second mailing was sent soliciting a second response. It contained a contact letter, the second form of the questionnaire (Appendix D), and reply materials. This response was sought to enable assessment of test-retest

reliability for the beliefs measure and to identify any changes in aerobic exercise status.

Those faculty not responding to the first mailing of each version of the questionnaire received reminder letters, succeeded by a followup mailing with contents duplicating the first. A lottery reward system was employed to encourage participation, using a drawing for a 50 dollar cash incentive for the first response, and 100 dollars for the second. Receipt of the reply/consent forms qualified each respondent for the drawings. The use of separate reply/consent forms enabled responses to be anonymous to assure honest self report. Subjects were prompted for the last four digits of their home phone number on each questionnaire as an identifying code for matching the questionnaire protocols in the subsequent analysis.

A total of 181 subjects sent in completed questionnaires and the reply/consent form, for a response rate of 54 percent. Two of the responses were unusable, one because the subject was under 25 years old, one because the questionnaire was only half completed. This left 179 usable first responses. The demographic characteristics of the subjects in this initial pool are summarized in Table 1 below. All these responding subjects received the second questionnaire within the specified time.

Table 1: Summary of Demographic Descriptors For All Respondents to Questionnaire One.

Observed	3--28-29 Years Old
Age Ranges	18--30-39 Years Old
	58--40-49 Years Old
	66--50-59 Years Old
	31--60-69 Years Old
Mean Age	50.7 Years Old (n=176)
Mean Weight	167.8 Pounds (n=176)
Gender	114--Male 63--Female (n=177)
Marital Status	15--Single 136--Married 20--Divorced 4--Separated 5--Living Together (n=178)
Education	41--Masters 125--Doctorate 11--Postdoctorate (n=178)
Ethnicity	161--Caucasian/White 4--African-American/Black 2--Native American 9--Asian/Pacific Islander (n=176) (Note: n varies due to omitted responses.)

For the second mailing, 165 completed returns were received, for an overall response rate of 49 percent and a 92 percent return rate by those completing the first questionnaire. As the responses were evaluated following data entry, it was discovered that number errors or omissions in subjects' recording of their phone number identifier resulted in the loss of fifteen pairings for

the responses, leaving a total of 150 usable pairs for those steps of the analysis requiring both replies.

Instrumentation

A questionnaire was developed for the measurement of personal health beliefs about health, illness, the benefits from aerobic exercise, and the barriers to aerobic exercise. The measure was entitled the "Personal Beliefs Questionnaire" (words for the title were chosen to avoid communicating a "set" to subjects). The instrument is composed of a beliefs assessment section, a section to determine the subject's own classification of their aerobic exercise adoption stage according to specified stages of aerobic exercise adoption (after Prochaska & DiClemente, 1983), a section for subjects to detail specific aerobic exercise behavior, a section to detail significant activities that were not aerobic exercise, and demographic background data on each subject.

Health Beliefs

The part of the questionnaire assessing health beliefs was patterned after work done on the Health Belief Model in other related areas (Becker, Maiman, Kirscht, Haefner, & Drachman, 1977). In an effort to assure maximum validity and reliability, items selected for use in the instrument retained the exact structure of previously used and validated items. Studies that served as sources for the items included Maiman et al. (1977), Jette, Cummings,

Brock, Phelps, & Naessens (1981), Champion (1984), with the employment of "aerobic exercise" as the criterion behavior for the items.

Additional items were selected from a pool drawn from instruments of known reliability and validity in assessing beliefs about exercise (Slenker, Price, Roberts, & Jurs, 1984; Cioffi, 1984; Sonstroem, 1987; instruments obtained from the authors). All items referring to beliefs about the criterion behavior of sustained aerobic exercise were accompanied in the instrument by the guidelines for aerobic exercise formulated by the American College of Sports Medicine (1978). These guidelines appear on every page where exercise-related questions are listed.

Included in the beliefs portion of the questionnaire were questions assessing five belief components: General Health Motivation, Perceived Susceptibility to illness, Perceived Severity of illness threat, Perceived Benefits of aerobic exercise, and Perceived Barriers to aerobic exercise. All items used in the beliefs portion of the questionnaire were constructed as seven-point Likert responses. The Likert method of investigation has been found to have the greatest convergent validity in Health Belief Model investigations (Cummings, Jette, & Rosenstock, 1978). Consideration was also given to the number of items used to sample each component's domain, to

insure overall reliability for that subscale. The minimum number of items accepted for use on any one scale was nine.

Following item construction, an evaluation of the items was conducted to insure content, or face validity for their respective subscales. This was accomplished through having the pool of items judged by experts familiar with exercise supervision and exercise programs. These experts were leaders in exercise and wellness programs in the Trenton area. Three such evaluators were asked to affirm the suitability of each item for measuring its intended component by assigning a randomized list of items to the hypothesized subscales after being familiarized with the conceptual intent of each. Those items not correctly assigned by at least two of the three judges were eliminated from further use. Feedback from the judges about the items was also considered in refining the final version of the questionnaire.

Exercise Status

The self-assessment of exercise participation was determined using a schema adapted from a study on smoking behaviors (Prochaska & DiClemente, 1983). Such a classification schema with exercise has been piloted by Sonstroem (1987). Subjects were requested to identify themselves using this framework. The actual labels were not employed in the instrument; categories were simply

numbered one through seven. Exercise, for this investigation, was considered to be intentional, regular aerobic (vigorous, with elevated heart rate) exercise, at least 3 times/week, at least 20 minutes per session. This level represents the most universal guideline for the level of exercise needed to sustain fitness (American College of Sports Medicine, 1978).

The framework labels as adapted for exercise were: Long term exerciser (Category #6)--Someone who has maintained a pattern of regular aerobic exercise for a period of not less than 18 months. Recent exerciser (Category #5)--Someone who has been engaging in aerobic exercise for any period up to nine months. Contemplator (Category #2)--Someone who has been seriously thinking about beginning an aerobic exercise program in the past year. Immotive (Category #1)--A person who is not an exerciser and not considering it. Relapser (Category #3)--A person who has tried but failed--for a period of less than six months--to begin an exercise program in the past year (adapted from Prochaska & DiClemente, 1983). Additional categories were added for purposes of this study, Past Exerciser (Category #4)--A person who has maintained a program of regular exercise for at least six months sometime in the past five years, and Dedicated Long Term Exerciser (Category #7)--A person who is a long term exerciser, but who exercises daily and for periods of longer than 45 minutes. The categories were numbered in a

hierarchical order of increasing investment in regular aerobic exercise.

The seven categories were presented in a section titled Your Exercise Pattern in the questionnaire. Accompanying the categories was a detailed description of the American College of Sports Medicine (1978) definition of the aerobic exercise parameters, for subjects to refer to in classifying their own exercise adoption stage. Subjects were prompted to choose the category that described their own current status.

Following the category self-assignment section was a section for subjects to describe the type, duration and frequency of aerobic exercise they are pursuing for use in verifying the accuracy of their responses. Such a survey method of physical activity assessment has been noted as the method of choice for this kind of research (LaPorte, Montoye, & Caspersen, 1985; Washburn & Montoye, 1986). It has been demonstrated that machine-aided objective methods are now achievable, but such techniques are seen as cumbersome and too expensive for most research (Washburn, Cook, & LaPorte, 1989).

Recall methods do have shortcomings in terms of accurate reporting (Perkins & Epstein, 1988), but the limitations were deemed acceptable given the need for a global view of exercise participation in this study. Thus, while considerably more comprehensive and detailed methods

of assessment are possible, for purposes of this study a characterization of the typical weekly activity level was all that was sought. Since significant levels of other activity were expected to be a part of subjects' lifestyles, an additional section followed, paralleling the one on aerobic exercise but prompting subjects to note activity that "represents exercise, but is not described by the definition of regular aerobic exercise". Space for subjects to describe the type, duration, and frequency of their activity was provided. Such assessment is considered a necessary part of appraising a subject's overall level of activity (Washburn & Montoye, 1986).

Information gleaned from the activity self-reports was used to construct a master variable denoting activity level. This was done to get a graded, purely behavioral assessment of involvement in activity and the level of that activity, as a contrast to the adoption stage self-assignment categories. The first category was labeled Sedentary, denoting those individuals who indicated no activity on either of the above self-report lists. The second category was named Minimal Activity, and was used for those who indicated no aerobic exercise, a duration of exercise less than twenty minutes per week and two or fewer times per week. The third category, Active, contained all respondents whose activity level exceeded the criteria for Minimal Activity but did not meet the study guidelines for aerobic exercise. Aerobic was the

final category, including all subjects whose activity was greater than three times a week, for longer than twenty minutes per session, and a verified aerobic exercise as defined by the American College of Sports Medicine (1978).

For the second administration of the questionnaire, revisions were made to detect changes that had occurred in the intervening month (Appendix D). A block of questions duplicating those in the first was included for subjects to indicate the level of aerobic exercise they had been pursuing in the time since the first questionnaire was taken. Additionally, an item to allow subjects to indicate whether their report represented a change in exercise status from the first to the second response to the questionnaire was included; a supplementary question sought information as to the perceived reason for the change.

Demographic Data

For the final section of each survey, each subject was prompted to provide information on their age, weight, level of education, marital status, gender, and ethnicity. The first four questions appeared on the first survey, while the latter two were inserted on the second. Information about weight was obtained in both administrations for possible use in subsequent analysis. Results for all qualifying subjects who fully completed the first questionnaire are summarized in Table 1 above.

Procedure

The first steps in the analysis of the collected data were designed to verify the reliability and validity of items employed in the Personal Beliefs Questionnaire. The method for these evaluative steps was based on the literature addressing test construction and evaluation (Cronbach, 1970; Keppel, 1973; Anastasi, 1978) as well as past Health Belief Model investigations with similar purpose or parallel goals (Maiman et al., 1977; Jette et al., 1981; Champion, 1984, Slenker et al., 1984). The goal was to develop a procedure that would capture as its features a standard and widely accepted methodology for Health Belief Model instrument development and application. In this manner results of the current study would be more readily interpretable, and future researches in this area would be provided with a greater foundation for replication or parallel investigation.

Data entry from the completed questionnaires was accomplished using a numeric keypad on an IBM terminal. Following entry of the data, the accuracy of the data capture was verified by comparing the data list with the original questionnaires. Analyses were run in a mainframe environment using the Statistical Analysis System (SAS). The verified data set was used as the basis of all further analyses, with adjustments in the alignment of variables continually saved as a master data set. Master variables

that summarized some of the data were created to simplify the analysis process.

Three steps were used to evaluate the reliability and validity of the items comprising each subscale. First, inter-item associations within each subscale were tested; internal consistency of each subscale was examined by calculating a coefficient alpha utilizing univariate statistics generated on the data (Cronbach, 1970). For the second step, inter-item correlation matrices were obtained for each subscale. Those variables showing unacceptably low correlation with their respective subscales were excluded from use in any further analysis. Finally, test-retest correlation coefficients were calculated for each subscale, utilizing items that were shown to be valid in the above tests. Item-by-item test-retest correlations were also examined to further identify items with unacceptably low reliability before instrument testing began.

Using results of the above tests to identify items inconsistent with their scales or showing poor reliability, those items were eliminated from the variable lists used in the succeeding calculations. The scale tests of internal consistency, test-retest reliability, and intercorrelation were re-computed to assess the change that resulted from the new configuration and to insure continued scale function at optimal levels. When scale statistics were judged to have an acceptable alignment as

indicated by the balance between reliability, independence as assessed by measures of intercorrelation, and internal consistency, that alignment was used for the analyses that followed.

Factor analysis was used as the first measure of construct validity. The first step in the analysis was a principal component factor technique, employed to determine whether the theoretical constructs of General Health Motivation, Perceived Susceptibility to illness, Perceived Severity of illness threat, Perceived Benefits of aerobic exercise, and Perceived Barriers to aerobic exercise were sufficiently distinct to be considered discrete beliefs. The technique also provided for interpretation of the obtained clusters of items. The principal component analysis facilitated identification of independent components and assessment of the overall amount of variance explained within each of the beliefs as measured by the instrument. A varimax rotation was used to verify distinct factors through assuring orthogonality as the factors were extracted (Keppel, 1973; Ray, 1982; Afifi & Clark, 1984).

Item by item correlations of questions with the different exercise adoption categories were computed to identify those items that alone showed significant correlation with each of the categories. Multiple regression was then applied using the five subscales, to

determine the amount of variance each was able to account for in the overall regression equation. Multiple regression is the tool of choice for evaluating the variance accounted for by subscales of a complete measure (Afifi & Clark, 1984; Kerlinger & Pedhazur, 1973).

Multiple regression allows the identification of those subscales accounting for the most variance in the various behavioral outcomes (Ray, 1982; Kerlinger & Pedhazur, 1973). It thus appears appropriate for successfully identifying the degree to which each belief component contributes to each dependent variable, the categories of exercise adoption or exercise behavior assessment measures. Another feature of multiple regression that suits it to the present study is that it can be used in stepwise fashion to identify the best equation for different independent variables (Kerlinger & Pedhazur, 1973; Isaac & Michael, 1983).

To evaluate the utility of the overall beliefs scale for predicting exercise class outcomes, discriminant analyses were performed for the two measurements of the study population. Subjects were grouped according to their classification of their aerobic exercise adoption category. The percentage of subjects correctly classified within each category was noted, along with those subscales accounting for the greatest portion of the overall variance.

CHAPTER 4 RESULTS

Evaluation of the Personal Beliefs Questionnaire

For item analysis and scale refinement purposes the items comprising the original questionnaire were assigned codes to be used in all succeeding steps (Appendix E). Data from the both administrations (First n=179, second n=165, matched pairs n=150) were used in the instrument evaluation steps. For comparative purposes the performance of items in the second administration of the questionnaire was noted, in order to highlight any discrepancies or unusual changes in the performance of the instrument in its two uses. No such discrepancies were observed.

The first evaluation of the scales, for internal consistency, yielded the results listed in Table 2. The coefficient alpha (Cronbach's Alpha) for each subscale was calculated utilizing univariate statistics generated on the data using the SAS routine UNIVARIATE. The five subscales--general health motivation (MOT), perceived susceptibility to disease (SUS), perceived severity of possible disease conditions (SEV), perceived benefits of aerobic exercise (BEN), and perceived barriers to aerobic

exercise (BAR)--all had alpha coefficients of 0.773 or greater.

Table 2: Coefficients Alpha for Initial Groupings of Questionnaire Items.

Subscale	Number of Items Comprising Subscale	Coefficient Alpha
MOT	9	0.833
SUS	15	0.829
SEV	15	0.773
BEN	12	0.931
BAR	11	0.888

For the next step, inter-item correlation matrices were generated for all variables and subscale scores, to allow each item's correlation with its subscale to be extracted. The items showing nonsignificant correlations with their respective subscales were then noted for removal from any further analysis (see Appendix E). An additional criterion for screening items was the pattern within the correlation matrix for each subscale. Items standing markedly apart from the general level or pattern of correlations achieved by companion items were also eliminated. Items excluded on the basis of poor relative intercorrelation with their subscales are listed in Table 3 along with the correlation each item had with its scale.

Finally, test-retest correlation coefficients were calculated for the subscales to assess further the reliability of the scales. Results appear in Table 4. Item-by-item test-retest correlations were also examined to further identify items with unacceptably low reliability before instrument testing began. Only one item not already screened was eliminated on the basis of poor test-retest performance, a BAR item (R1). The item removed addressed worry about regular exercise causing health problems.

Table 3: Questionnaire Items Screened Due to Poor Relative Association With Subscale.

Item Code and Content	Product-Moment Correlation with Subscale Total Score (Pearson's r)
H8 (MOT) Other things more important than health.	0.468***
S1 (SUS) Chance of getting asthma.	0.395***
V8 (SEV) Seriousness of cold	0.168ns
V9 (SEV) Seriousness of a cavity	0.083ns
V11 (SEV) Seriousness of sickness	0.232*
V12 (SEV) Seriousness of lacking energy	0.368***
V15 (SEV) Seriousness of overweight	0.311**
B12 (BEN) Regular exercise provide friendship/socializing	0.580***

***= $p \leq .001$ **= $p \leq .01$ *= $p \leq .05$

Note: See Appendix E for complete item texts.

Removal of items from the subscales was expected to produce changes in their performance. To assess the change, the scale tests of internal consistency,

test-retest reliability, and intercorrelation were re-computed to assess the change brought about by revision of the subscales. Table 5 displays the resulting reliability coefficients. For all scales but BAR, internal consistency was improved; consistency coefficients were all 0.832 or greater.

Table 4: Questionnaire Subscale Test-Retest Correlation Coefficients.

	Correlation Coefficient
MOT Subscale	0.829***
SUS Subscale	0.819***
SEV Subscale	0.575***
BEN Subscale	0.841***
BAR Subscale	0.880***
n=150 ***=p $\leq$.001	

Test-retest reliability as gauged by computed correlations retained the levels of association displayed in the first administration of the questionnaire (Table 6). A diminution in the observed correlations was seen in four of the five subscales, as was expected when items were removed from the test measure. The common pattern is that a scale with fewer items generally is less reliable than a longer one. All scale correlations remained significant at the $p \leq 0.001$ level. Additionally, only one

item was found to be below the $p \leq 0.001$ level of significance for correlation with its subscale, achieving a $p \leq 0.01$ level of significance. All retained items were significant at the $p \leq 0.001$ level on test-retest correlations. Based on the results of the test-retest correlations and the measures of internal consistency, the scales were judged to be reliable and Hypothesis 1 was

Table 5: Coefficients Alpha for Final Groupings of Questionnaire Items.

Subscale	Number of Items Comprising Subscale	Coefficient Alpha
MOT	8	0.850
SUS	14	0.832
SEV	10	0.859
BEN	11	0.935
BAR	10	0.859

accepted. Scale alignments were judged to have an acceptable structure as indicated by sampling, reliability, and internal consistency. The revised structure was thus adopted for the ensuing analyses.

Toward assessing the construct validity of the subscales, a determination of the degree to which the subscales were mutually independent was sought. Prior to the application of factor analysis, the correlation matrix

Table 6: Questionnaire Subscale Test-Retest Correlation Coefficients for Final Item Groupings.

	Correlation Coefficient
MOT Subscale	0.811***
SUS Subscale	0.818***
SEV Subscale	0.531***
BEN Subscale	0.840***
BAR Subscale	0.883***
Total Scale	0.813***
n=150 ***=p $\leq$.001	

obtained in the above determinations of reliability for the revised instrument was used as the source of a matrix of subscale intercorrelations, reproduced in Table 7. Each scale correlation with each other scale below the diagonal was recorded. A number of the intercorrelations between subscale scores were significant.

To appraise the degree to which subscales function as independent constructs, factor analysis was used as the second overall measure of construct validity. The first step in the analysis was a principal component factor technique, employed to determine whether the theoretical constructs represented by the MOT, SUS, SEV, BEN, and BAR subscales were in fact sufficiently distinct to be considered separate beliefs. Using the SAS routine FACTOR,

a factor analysis with principal components specified in an orthogonal varimax rotation yielded a factor matrix.

Scree plotting of the eigenvalues obtained served to identify five factors as the most meaningful (accounting for the most variance proportionately) of those obtained.

Table 7: Subscale Correlation Matrix for Final Item Groupings.

	MOT	SUS	SEV	BEN	BAR
MOT Subscale	(1)				
SUS Subscale	-0.064ns	(1)			
SEV Subscale	0.141ns	0.267**	(1)		
BEN Subscale	0.361***	-0.028ns	0.206*	(1)	
BAR Subscale	0.422***	-0.229*	-0.110ns	0.395***	(1)
n=179 ***=p ≤ .001 **=p ≤ .01 *=p ≤ .05					

The five factors together accounted for 51% of the overall variance. The factor groupings are shown in Table 8 with their eigenvalues. Groupings were obtained by noting factor loadings occurring in clusters, bounded by drops in the loadings of other variables. Only items with factor loadings of 0.35 or greater were used in the groupings. The examination of factor grouping content will be discussed in Chapter 5. Based on factor analysis results and an examination of the subscale intercorrelations, Hypothesis 2 was only weakly supported and must be

rejected. There appears to be significant association between certain subscales, most notably MOT, BEN, and BAR.

Table 8: Summary of Factor Analysis Results.

Factor	Subscale and Items	Eigenvalue	Percent of Variance	Cumulative Percentage
1	BEN (9) BAR (5) MOT (1)	10.381	19.59	19.59
2	SEV (6) SUS (1)	6.806	12.84	32.43
3	MOT (5)	3.795	7.16	39.59
4	SUS (6)	3.476	6.56	46.15
5	BAR (2)	2.690	5.07	51.22

A Test of the Predictive Validity
of the Personal Beliefs Questionnaire

An examination of the distribution of subjects in the exercise adoption categories found a good distribution with the exception of category 7, as may be seen in Table 10. Given so few subjects in the top category, the decision was made to combine Categories 6 and 7 for the tests of predictive validity.

Prior to the regression analysis, item correlations with the dependent exercise adoption category variable obtained in the second administration were computed. The matrix was examined to identify those items showing greatest correlation with each of the categories. Items

correlating at a level 0.35 or higher are reported in Table 10. Items were keyed so that all responses in the

Table 9: Distribution of Subjects in Exercise Adoption Categories.

Exercise Adoption Category	First Administration	Second Administration
1	22 (12.3%)	21 (12.8%)
2	20 (11.2%)	24 (14.6%)
3	27 (15.1%)	23 (14.0%)
4	39 (21.8%)	38 (23.2%)
5	18 (10.1%)	15 (9.1%)
6	49 (27.4%)	39 (23.8%)
7	4 (2.2%)	4 (2.4%)
	Total 179	Total 164

direction that would be expected to result in health protective behavior scored low values, thus all correlations with the increasing value scale of exercise adoption are negative. The results of this analysis showed the strongest and greatest number of correlations to be occurring in the Barriers scale.

Stepwise multiple regression was then applied using a composite of all independent variables measured, including the five health belief subscales, to determine the strength of each in the overall regression equation. The analysis was implemented through the SAS routine STEPWISE

(Ray, 1982) to identify the subscales accounting for the variance in the criterion categories and exercise levels

Table 10: Individual Items Correlating Most Highly With Adoption Stage Criterion.

Item Number and Subscale	Content (For complete text see Appendix E)	Pearson Product Moment Correlation Coefficient
H3 (MOT)	How good job caring for health right now	-0.37***
H5 (MOT)	Best description number behaviors to insure health	-0.36***
H6 (MOT)	Frequently do things to improve my health	-0.40***
H9 (MOT)	Health habits I practice	-0.36***
B1 (BEN)	How much regular exercise improve your overall health	-0.36***
R5 (BAR)	How difficult maintain program regular exercise	-0.64***
R6 (BAR)	How much regular exercise interferes with activity	-0.51***
R7 (BAR)	Regular program exercise difficult to schedule	-0.57***
R8 (BAR)	Maintaining program regular exercise more trouble than worth	-0.57***
R9 (BAR)	Preference to do other things could keep me from exercise	-0.45***
R10 (BAR)	Lack of desire could keep me from regular exercise	-0.57***

Matched pairs n=150 ***=p ≤ .001

observed in the second administration of the questionnaire. The end product is shown in Table 11, in which all variables were included to exhibit the role each plays in the prediction of adoption category. Only two of

the variables were significant at the $p \leq 0.05$ level, BAR and SEV.

The barriers subscale appears to play the dominant role in prediction, accounting for almost 40% of the overall variance. About 44% of the variance was accounted for overall with all the predictor variables entered; results were significant at the $p \leq 0.001$ level. The only other predictor variable achieving significance was the severity subscale, accounting for about 2% of the variance. The only non-belief variable contributing meaningfully to the prediction of the dependent variable of exercise adoption category was age, with over one percent of the variance attributable to this feature.

Table 11: Sources of Variance in Exercise Adoption Categories.

Variable	R Square	Change in R Square	Overall F Value
BAR	0.396	0.396*	93.59***
SEV	0.412	0.016*	49.74***
Age	0.426	0.014	34.85***
BEN	0.432	0.006	26.58***
MOT	0.434	0.002	21.28***
SUS	0.435	0.001	17.73***
Weight	0.437	0.002	15.16***
Ethnicity	0.438	0.001	13.23***
Mar. Status	0.438	0.000	11.70***
Term. Degree	0.438	0.000	10.46***
Gender	0.438	0.000	9.44***

*= $p \leq 0.05$ ***= $p \leq 0.001$ (Final DF 11,133)

The analysis was repeated utilizing only the five belief variables, to differentiate the instrument

variables from those comprising the makeup of the subjects taking the measure, and provide full focus onto the test of the Health Belief Model belief variables. Such a prediction analysis shows which variables would be of interest to future intervention studies in the area of aerobic exercise adoption.

Table 12 exhibits the findings from the stepwise procedure, showing a change in the order in which the belief variables entered into the prediction equation. Only the BAR subscale was significant, accounting for almost 37% of the overall variance. Overall, the combination of the five subscale variables accounted for 40% of the variance in predicting aerobic exercise adoption stage. Based on the results of the analysis for the five belief variables, Hypothesis 3 was accepted.

Table 12: Sources of Variance From Health Belief Model Belief Subscales in Exercise Adoption Categories.

Variable	R Square	Change in R Square	Overall F Value
BAR	0.368	0.368*	85.60***
MOT	0.383	0.015	45.29***
BEN	0.390	0.007	30.94***
SUS	0.395	0.005	23.54***
SEV	0.397	0.002	18.86***

*= $p \leq 0.05$ ***= $p \leq 0.001$ (Final DF 5, 143)

A similar brace of stepwise regressions was performed utilizing the two variable groupings, with the criterion behavior the exercise assessment category synthesized from

subjects' self-report about activity. For the first regression, it became apparent that the overall composite of variables was accounting for less of the variance with the behavior based category than with the categories based on self-assignment to exercise adoption categories (Table 13). Approximately 36% of the overall variance in exercise assessment category was explained by the eleven independent variables.

The most meaningful variable in the exercise assessment analysis was, again, the barriers subscale, accounting for 31% of the variance. For the analysis of the composite variable set, it was the only variable to achieve significance at the $p \leq 0.05$ level. The order in which the variables entered into the equation in this case

Table 13: Sources of Variance in Exercise Behavior Categories.

Variable	R Square	Change in R Square	Overall F Value
BAR	0.310	0.310*	64.74***
SEV	0.343	0.033	37.35***
MOT	0.350	0.007	25.55***
Ethnicity	0.353	0.003	19.26***
Term. Degree	0.355	0.002	15.43***
BEN	0.357	0.002	12.84***
Age	0.358	0.001	10.98***
SUS	0.358	0.000	9.56***
Mar. Status	0.358	0.000	8.44***
Gender	0.358	0.000	7.54***
Weight	0.358	0.000	6.80***

*=p $\leq$ 0.05 ***=p $\leq$ 0.001 (Final DF 11,134)

changed as well, with the demographic variables Ethnicity, Terminal Degree, and Age entering in ahead of the last beliefs variable. The amount of variance accounted for by these variables, however, was negligible.

For the second run on exercise assessment with only the belief subscale variables included, the drop in overall variance accounted for was similar to that noted in the first comparison with the adoption category regressions (Table 14). Two variables achieved significance, with BAR and SEV together accounting for 34% of the overall 35% of the variance that could be explained by the belief subscales. As with all the other regressions performed, the F value showed the overall R square of the variable set to be significant at the $p \leq 0.001$ level. Hypothesis 4 was thus accepted.

Table 14: Sources of Variance From Health Belief Model
Belief Subscales in Exercise Behavior Categories.

Variable	R Square	Change in R Square	Overall F Value
BAR	0.310	0.310*	65.96***
SEV	0.342	0.032*	37.87***
MOT	0.350	0.008	26.11***
BEN	0.352	0.002	19.53***
SUS	0.352	0.000	15.55***

*= $p \leq 0.05$ ***= $p \leq 0.001$ (Final DF 5, 143)

A variant of the analysis on exercise behavior categories was performed to identify the degree to which the beliefs variables could predict exercise behavior when

only the two poles of behavior were used. The exercise assessment categories of Sedentary and Aerobic were selected to provide an example with more pronounced differences in the criterion categories. The outcome of this analysis is shown in Table 15. The proportion of variance explained was the highest of any of the observed R-squares obtained in the stepwise regressions performed.

A pattern observed in the documenting of the predictive strengths of the independent variables in the study--that continued in this analysis--was the emergence of the barriers subscale as the principal predictor. Not much distribution of assessed variance among the other variables was noted in any of the regression analyses, with the severity subscale entering in as the second most significant variable in all but the instance of exercise adoption using the five subscales. Age appears to play a small role in prediction as one of the composite array of variables in the exercise adoption category.

Table 15: Sources of Variance From Health Belief Model
Belief Subscales in Antipodal Exercise Behavior
Categories.

Variable	R Square	Change in R Square	Overall F Value
BAR	0.468	0.468*	61.47***
SEV	0.500	0.032*	34.43***
MOT	0.509	0.009	23.51***
SUS	0.511	0.002	17.48***
BEN	0.511	0.000	13.78***

*= $p \leq 0.05$ ***= $p \leq 0.001$ (Final DF 5, 66)

To note any change occurring in the regression results from the first administration to the second, the maximum R-squares obtained from the stepwise regressions were compared (Table 16). For the analyses, the beliefs variables obtained on the first administration of the questionnaire were regressed on the criterion variables obtained in both the first and second administrations. While the performance of the predictor variables dropped for the exercise adoption categories, it rose for both exercise behavior analyses performed. No change was noted in the order in which the predictor variables entered into the regression equation.

Table 16: Change in Total R-square For Criterion Variables From First to Second Administrations Using Independent Belief Variables Obtained in First Administration.

Criterion Variable	First Administration R-square	Second Administration R-square
Adoption Categories	0.439*** DF 5, 172	0.397*** DF 5, 143
Exercise Behavior Categories	0.345*** DF 5, 172	0.352*** DF 5, 143
Antipodal Exercise Behavior Categories	0.440*** DF 5, 90	0.511*** DF 5, 66
***= $p \leq 0.001$		

To test the hypotheses regarding the utility of the overall beliefs scale for predicting exercise category outcomes, discriminant analyses were performed using the measurements of the belief variables obtained on the study population. The performance of the beliefs variables in assigning subjects to the categorical dependent variables of exercise adoption category, exercise behavior category, and change category noted in the second administration of the questionnaire. The six adoption categories Immotive, Contemplator, Relapser, Past Exerciser, Recent exerciser, and (Dedicated) Long term exerciser were used for the first discriminant analysis. The four exercise behavior classifications of Sedentary, Minimal Activity, Active, and Aerobic were used for the second, and the third was conducted using the extremes of the exercise behavior classifications Sedentary and Aerobic as was noted above in the results of the regression analysis. The test of the predictive efficacy of the beliefs was conducted, but the number of subjects indicating a change in their exercise behavior (24, or 16% of all matched pairs) was judged to be low for a meaningful interpretation. All analyses were conducted using the DISCRIM package of SAS (Ray, 1982).

The results of the discriminant analysis for the exercise adoption categories appear in Table 17, a matrix allowing "hit" and "miss" totals to be shown for each cell of predicted versus actual status for the 149 subjects

examined. The overall classification rate was 45 percent correct assignment for all subjects. This performance of the measure well exceeded the chance rate of 16.7 percent for each cell. The adoption categories where prediction was least accurate were Past Exerciser and Relapser. The results offer low but sufficient support for accepting Hypothesis 5.

Table 17: Number of Observations and Percents Classified Into Exercise Adoption Categories.

		Predicted Category						Total N
		1	2	3	4	5	6	
A	Immotive	10	2	2	2	2	0	18
	(1)	55.6%	11.1%	11.1%	11.1%	11.1%	(0)	
C	Contemplator	5	12	2	1	0	2	22
T	(2)	22.7%	54.5%	9.1%	4.5%	(0)	9.1%	
U	Relapser	3	4	7	4	2	0	20
	(3)	15.0%	20.0%	35.0%	20.0%	10.0%	(0)	
A	Past	6	8	3	7	8	4	36
L	Exerciser	16.7%	22.2%	8.3%	19.4%	22.2%	11.1%	
	(4)							
	Recent	0	1	1	2	5	4	13
	Exerciser	(0)	7.7%	7.7%	15.4%	38.5%	30.8%	
	(5)							
	Long Term	0	2	0	0	12	26	40
	Exerciser	(0)	5.0%	(0)	(0)	30.0%	65.0%	
	(6)							

n=149 Prior probability, each cell=16.7%

In the application of the discriminant analysis technique to the example of behavior, an improvement in the performance of the beliefs variables was noted, as shown in Table 18. The percentage of correct

classification overall was 52 percent, compared to a chance rate of 25 percent. While all cells again exceeded chance, the Sedentary category showed distribution of actual subjects across all predicted categories.

Table 18: Number of Observations and Percents Classified Into Exercise Behavior Categories.

		Predicted Category				Total N
		1	2	3	4	
A	Sedentary (1)	8 29.6%	9 33.3%	6 22.2%	4 14.8%	27
C	Minimal (2)	6 18.8%	21 65.6%	4 12.5%	1 3.1%	32
U	Active (3)	6 13.3%	11 24.4%	16 35.6%	12 26.7%	45
A	Aerobic (4)	5 11.1%	1 2.2%	6 13.3%	33 73.3%	45

n=149 Prior probability, each cell=25%

As before when examining the ability of the model to account for overall variance, an analysis of the combined strength of the model variables in predicting two behavioral categories with little overlap was done to test the accuracy with dichotomous classification. In Table 19, the correct classification rate overall was 82 percent, with the chance rate for two categories at 50 percent. Presented with these results and those of the preceding analysis, Hypothesis 6 was accepted.

Table 19: Number of Observations and Percents Classified Into Antipodal Exercise Behavior Categories.

		Predicted Category		Total N
		1	2	
A	Sedentary	23	4	27
C	(1)	85.2%	14.8%	
T				
U	Aerobic	9	36	45
A	(2)	20.0%	80.0%	
L				

n=72 Prior probability, each cell=50%

As was noted above, the planned test of the model in predicting a change in exercise activity was hampered by a low number of subjects indicating a change. Examination of the data showed that, for those indicating a change, their report of activity level did not support the assertion. The data review also revealed that there were twenty-five additional changes in exercise activity, as assessed on the exercise/activity responses, that subjects did not record.

It was decided to examine the capability of the model variables to predict the changes, producing the results in Table 20. In this case, again with the rate of chance being 50 percent, the belief variables allowed a correct prediction rate of 75 percent. While this was seen as support for Hypothesis 7, the results must be heavily qualified.

Table 20: Number of Observations and Percents Classified Into Self-Reported Change in Exercise Behavior Categories.

		Predicted Category		Total N
		1	2	
A	Decrease	3	2	
C	(1)	60.0%	40.0%	5
T				
U	Increase	4	15	
A	(2)	21.1%	78.9%	19
L				

n=24 Prior probability, each cell=50%

CHAPTER 5 DISCUSSION

The results of this study show support for the Personal Beliefs Questionnaire as an effective instrument for beliefs assessment and for the ability of the beliefs so measured to distinguish between different categories of subjects. Relative to other studies of this type (Jette et al., 1981; Wagner, 1983), the current effort resulted in an acceptable instrument that shows potential for application in exercise adoption programs. For research, at least, the findings warrant further employment and evaluation of the Personal Beliefs Questionnaire with populations of potential exercisers.

The Comparative Efficacy of the Personal Beliefs Questionnaire

Using other carefully conducted Health Belief Model instrument development projects as benchmarks (e.g. Champion, 1984), the Personal Beliefs Questionnaire had comparatively excellent internal consistency for its scales. Other studies of this type (Jette et al., 1981; Slenker et al., 1984) have recorded alpha coefficients from 0.30 to 0.92, with most values occurring in the 0.65--0.80 range. With the range for the current study from 0.83--0.94 for the final item groupings, the scale

from 0.83--0.94 for the final item groupings, the scale groupings of items show a high degree of internal consistency.

Observed test-retest correlations evidenced good reliability as measured by test-retest correlations. Reported correlations from the above-cited studies occur in a range from 0.35--0.87, with most values observed between 0.65 and 0.83. The SEV subscale, with the most items removed in the development of the survey, showed the loss in a correlation that was substantially lower than its companion scales.

These favorable findings are believed to result in part from the use of previously validated items or item structures wherever possible in instrument construction. The result achieved was considered impressive given that beliefs were being assessed. Beliefs have been demonstrated to be a dynamic psychological constructs that are subject to change from many different influences.

One way in which the benefits of using previously validated items did not extend to the new alignment of items was in the subscales' achievement of independence from each other as assessed by intercorrelation. The failure of this hypothesis to be supported is based on the number of intercorrelations found to be significant in the analysis. Other studies where scales have been developed have observed higher scale intercorrelations than the

current study, and those correlations have been noted without comment about their threat to the ability of the belief components to measure what they purport to measure (Maiman et al., 1977; Given, Given, Gallin, & Condon, 1983). Many other studies consulted report no computations of scale intercorrelations other than what may be inferred from factor analyses. This lack of attentiveness to scale independence appears to be a weakness in the method generally utilized in Health Belief Model research for the evaluation of instruments..

Assessing the Criterion Validity of the Personal Beliefs Questionnaire

Factor analysis, while providing some support for the five beliefs constructs as independent entities, also detects and expresses some subscale overlap, in a manner different from the above test of intercorrelation. The five most significant scales, as determined by scree plotting and judgement of the overall eigenvalues contributed by the factors, clustered around content largely supportive of the Health Belief Model (see page 111). Factor 1 included items addressing what was summarized as "aerobic exercise approach/avoidance". The items in this cluster were from opposite poles of a pair of related constructs--perceived benefits and perceived barriers--and addressed expectations resulting from personal action/exercise. They are a good operational illustration of the personal fields referred to by

Rosenstock (1974a), in which a person moves towards positive fields and away from negative ones. The expectations specified were notable for the positive and negative features associated with the stimulus of aerobic exercise. Their co-occurrence in one factor (with a like item from the health motivation subscale) appears to illustrate a continuum being assessed by the two constructs, with each construct making up one of the poles. The unitary association of these separate constructs has been noted in other Health Belief Model studies (Cummings, Jette, and Rosenstock, 1978).

Factor 2 was labeled simply "health threat" and was comprised of items from the severity subscale (with one susceptibility item) addressing the seriousness of specific conditions such as cancer, heart trouble, and the flu. Again, the correspondence of this factor to the field theory roots of the Health Belief Model is not hard to discern. Factor 3, "behavioral self-assessment of health protection" contained items from the health motivation subscale that assessed specific behavioral evidence of health motivation, as opposed to attitudinal expression. The items' content reflected a personal stock-taking of behavioral commitment to health.

The fourth factor was titled "likelihood of everyday illness" and was composed of items from the susceptibility subscale. This was the factor corresponding most closely to the hypothesized nature of the construct

it represents. The illnesses represented in the items were the less serious ones, such as flu, strep throat or a cold. Factor 5 clustered around "specific fears about injury while exercising", and was made up of items from the barriers subscale. These questions both addressed injuries that could occur while exercising, fears about which could serve as barriers to performing the exercise. While the results of the factor analysis were not a pure, item-by-item confirmation of the model components, the nature and configuration of the clusters was seen as highly supportive of the five beliefs subscales as independent constructs.

When used to evaluate the scales in the Health Belief Model for their independence and ability to measure separate, discrete constructs, factor analysis findings have been quite variable. Most studies report the model to be supported by the findings of factor/principal component analysis, with occasional indications of revision suggested (Wagner, 1983; Slenker et al., 1984). Model performance is very dependent on the behavior being assessed, with a much different configuration likely for sick-role or illness behaviors than for preventive behavior like aerobic exercise.

Construct validity gained a second confirmation from the regression analyses performed. An additional benefit from the prior-validation strategy of item selection may

have been realized in the figures achieved accounting for the variance in the criterion variables. The range as determined by R-squares was from 35% to 51% of the overall variance, comparing favorably to other Health Belief Model studies (Jette et al., 1981; Wagner, 1983). The major portion of variance remains unaccounted for, however, even with fairly good comparative efficacy by the Personal Beliefs Questionnaire. It was beyond the scope of this study to successfully assess and control for the number of factors associated with exercise outcomes that are listed on page 50 (Powell, 1988); what may be safely concluded is that beliefs play a significant role in differentiating aerobic exercisers from nonexercisers. In observing the overall variance that the instrument was able to account for in regressions on the kinds of exercise categories posited for this study, it is clear that some major sources of variance were not included in the universe of variables sampled.

The test of the demographic variables likely to affect exercise outcomes revealed no significant relationship with the outcome variables. With the exercise adoption categories age did enter third into the regression model, accounting for approximately one and a half percent of the overall variance. Examination of the correlation matrix of subscale total scores, demographic variables and dependent variables showed no significant association for age with the second reporting of exercise

adoption category. The relationship between age and adoption category that was noted was a negative correlation, showing that younger respondents tended to be in higher categories. It should be emphasized that the relationship was slight. Weight, a variable often associated with peoples' exercise habits, did not correlate significantly with outcome variables assessed in this study.

The observed change in total variance accounted for in the criterion variables from the first administration to the second was found to be as expected for the exercise adoption categories, with a slight decrement noted. Similar findings were obtained in one of the few repeated measures reported in Health Belief Model research (Becker et al., 1977). The unexpected result was the change recorded in the amount of variance accounted for in the behavioral outcome variables. Especially for the antipodal categories of Sedentary and Aerobic, the belief variables showed a marked upward difference in predictive potency when the retest categories were used in a regression that included initially obtained beliefs. Whether this is evidence of causality on the part of observed beliefs or the result of attrition of subjects from the sample between the administrations of the questionnaire is not clear.

In applications of discriminant analysis Afifi & Clark (1984) recommend that the number of variables used in predicting class be greater by two than the number of class-cases being predicted. While all of the analyses performed met this qualification, the result for the category where respondents noted an increase or decrease in activity must be considered spurious. A regression analysis performed on the change category showed no predictor variables accounting for a significant portion of the variance, with belief variables accounting for only eighteen percent of the total variance. With documentation of a relationship lacking, the seemingly good prediction rate is more likely "noise".

Slenker (1984), when applying her measure that assessed beliefs about jogging, found a "hit" rate of 92 percent when distinguishing between joggers and nonexercisers. Using the separated categories of Aerobic and Sedentary as the classification variables, the beliefs assessed in the Personal Beliefs Questionnaire were able to correctly classify 82 percent. Given the broader definition of exercise chosen for this study, this was regarded as a good performance of the instrument in distinguishing the categories. Similarly, for the full range of exercise behavior and for the exercise adoption categories, the instrument performed well when compared to the chance rate.

A less sophisticated assessment of the instrument's performance was apparent from a review of the overall total scores obtained when plotted against the antipodal categories of Aerobic and Sedentary. With all items keyed to produce a low score if expected to be associated with an "exercise" outcome, high for non-exercisers, the range for the total scores was from 102 to 312. The median score for the outcomes observed was 171. For the sedentary group, 7 scored below, 20 above the 171 score. Within the aerobic exerciser group, 28 scored below, 17 above 171. These observations demonstrate the nature and meaning of the distribution, showing that a higher score is more likely to be associated with a non-exerciser, a lower score with an exerciser.

The distribution of scores was conspicuously more spread out for the aerobic category than for the sedentary group, when one outlier was discarded. Range for the aerobic group was 126, from 102 to 228, while the sedentary group range was 65, from 158 to 223. All 20 of the observations with scores of 153 or lower were in the aerobic category. Thus it appears that threshold level in overall scores of 150 or below could predict an aerobic exerciser very reliably, while interpreting scores at the middle and upper parts of the range would be far more ambiguous.

Limitations Affecting the Results of This Study

In applying the learnings from this study to other situations, the limitations inherent in the sample and execution of the study will need to be taken into account. The sample population was chosen to assure members of the sample would be over the age of 25, and the goal was certainly realized. Only one of the questionnaires had to be discarded due to the age of the respondent. Those sampled, as can be readily seen on page 92, were nearly all Caucasian/White, very well educated, and older than typical social science research samples. The sample was also not random, as almost all of the available pool was utilized. These characteristics make it representative of most college and university faculties, but limit generalizability to other populations.

While this may control for some factors and allow for firmer conclusions about the use of such an instrument with a sample characterized by such an advanced level of education, older average age, and limited diversity, the similar performance of the instrument with a more general population is not assured. The sample was also likely skewed toward a higher average income, although this information was not gathered. Future work would be best served by a more ethnically diverse, younger adult sample with a more varied educational background. This would be

keeping with the practice of most previous Health Belief Model investigations.

Response rate was less than expected; while deemed acceptable for purposes of this study, it made for a smaller than desired pool of subjects with which to evaluate an instrument. Data were entered in the order received to enable response delay effects to be isolated if they occurred; none were identified. Item attrition that occurred during instrument evaluation was also less than expected, such that the desired ratio for doing factor analysis was not achieved in the current study. A recommended factor analysis ratio is an n of at least four to five times the number of variables being analyzed (Gorsuch, 1983). The ratio achieved in this study was 3.38, which makes the results of the factor analysis employed in the study meaningful, but possibly suspect. The sample size was considered adequate for the other analyses.

An additional factor affecting the soundness of the study is introduced by virtue of the fact that there is some association between the scales. This makes for multicollinearity; when variables are associated they covary in ways that make analysis--especially regression analysis--harder to interpret. The level of association between the independent variables in this study was sufficiently low that multicollinearity was not considered

a major factor, but neither is there complete freedom from its influence. Replication of this study would identify whether this was a sample or instrument effect.

The component of exercise assessment encountered some problems in the execution of this study; in the literature on exercise assessment there are indicators that such problems have not yet been resolved even in very sophisticated studies (Perkins & Epstein, 1988). One of the factors noted in reviewing the data was what appeared to be a social desirability effect. Kirscht (1983) comments that self-reports of socially desirable behavior are over and socially undesirable behavior are under actual levels.

In the present study, it was noted that fifteen of the subjects reported they were in Category 6 (Long term exerciser) on the first administration of the questionnaire when their exercise self-report did not concur, nine did so on the second. The converse situation, not reporting aerobic exercise when the exercise questions indicated the level was indeed satisfying the American College of Sports Medicine (1978) minimums, occurred seven times in the first administration, six in the second. In accounting for discrepancies observed between the exercise adoption and the actual behavior reported on the measures, there appears to be an effect from the perceived desirability of being an aerobic exerciser.

Participation in exercise was high as reported by the sample population. Where Powell (1988) reports that nine to twenty percent of adults exercise at an aerobic level, thirty percent of the subjects returning both questionnaires indicated exercise activity that fit aerobic exercise criteria. When exercise levels that could be considered active (greater than twenty minutes per session and three or more times per week) were considered, the level for the sample population rose to sixty percent, as opposed to a range of twenty to fifty-five percent reported in the Powell (1988) chapter. Powell reports that males tend to exercise more than females, persons of higher socioeconomic status exercise more than those of lower socioeconomic status, and younger persons exercise more than do older persons. Given the impact of these contributing factors, the knowledge that two of the three factors characterize this sample leads to the likelihood that they contribute to the higher reported rates, as does the availability of more leisure time for this population.

While over-reporting of exercise participation has been observed as a drawback of the self-report method (Washburn & Montoye, 1986), the higher levels of participation reported by this sample are believed to be accurate for a study of this type. There was a high degree of correspondence between the adoption categories reported and the exercise participation as noted in the type,

duration, and frequency blanks on the survey. The campus surveyed has an extensive, well-attended program for exercise and wellness that may contribute to the abnormally high participation rates observed.

Implications for Future Research on the
Precursors to Aerobic Exercise Behavior

Peoples' perceptions about barriers to exercising appear to be emerging as one of the major factors contributing to their decision-making and behavior in the realm of aerobic exercise. Slenker et al. (1984) noted similar findings in differentiating between joggers and nonexercisers. In the case of exercise, then, it seems that beliefs about perceived barriers play a central role in whether someone ultimately adopts an exercise program, whether in the specific area of jogging or the more general, multiple exercise criterion examined in the present study. It was believed that a study of this sort might perform less well given the much broader definition of exercise employed. While the scores found were less impressive than the Slenker et al. (1984) study, they compare favorably to most other applications of this methodology to health-protective behavior (Silver, 1983; Champion, 1984; Chen & Tatsuoka, 1984; O'Connell et al., 1985).

Unlike some other recent studies investigating the role of Health Belief Model beliefs in the determination of exercise status (e.g. Slenker et al. 1984), the present

study found very little predictive power inherent in the belief components other than perceived barriers. Perceived severity played a minor role in accounting for the variance in the criterion categories or as weight in prediction equations. This confirms earlier observations by Rosenstock (1974a) that one of the driving forces causing people to act--that the Health Belief Model approach to assessment identifies--is an avoidance orientation in response to a perceived threat.

At least in regard to exercise, a way of weighting the belief variables so that more information from the other areas may be contributed is recommended to overcome what appears to be an almost unidimensional way of functioning. Perceived barriers has been shown to be the dominant belief affecting prediction and accounting for the most variance in studies of exercise/preventive behavior. While perceived susceptibility and perceived severity have contributed much in past investigations of illness-related and sick-role behavior, their role becomes limited in preventive behavior investigations. Either modification of the model or its employment in the area of exercise behavior is indicated. Scale refinement would be possible if this method were to be used in conjunction with programs that deal with exercise adoption. It may be possible to obtain needed information about critical

beliefs such as perceived barriers without using the entire instrument to assess all beliefs.

Along with the effort to apply the Health Belief Model to the area of general aerobic exercise, this study was also an attempt to develop and employ a standard method for use in studies of health-related behavior. It is believed that the employment of items from the pool already tested and in use helped to deliver a more reliable and valid instrument, as well as results that may be more easily compared to other studies. One of the originators of the model has repeatedly called for such an effort so that the value of succeeding studies would be increased (Janz & Becker, 1984).

For future studies addressing exercise behavior, whether or not they are in the realm of attitude/belief research, a standard, usable, and universal protocol for assessing exercise is needed. While this study used self-report around a widely-recognized standard (American College of Sports Medicine, 1978), the comparative value is compromised by the unique nature of the scales devised. Just as many different instruments have been employed in Health Belief Model research, there has also been a plethora of different kinds of exercise measures, each slightly different (Perkins & Epstein, 1988). Until practical approaches are made feasible and reliable for

objective measurement, a standard for self-report is indicated.

The adoption-stage schema for exercise based on the Prochaska and DiClemente (1983) behavior change theory described on page 38 seemed to gain support in this study, in that subjects presented with the descriptors for the categories self-assigned to an almost uniform distribution across the stages, a finding duplicating the other known instance of this schema to exercise (Sonstroem, 1987). Additionally, the predictor variables did moderately well at differentiating between the stages, implying progressively greater investment in aerobic exercise. This could mean a greater level of either behavioral or cognitive activity separates subjects in the category levels. The greater amount of variance accounted for with the six adoption stages as compared to the four exercise behavior categories may be due, in part, to the additional psychological mechanisms or elements of change assessed by the instrument. The hypothesized process of exercise adoption is one that is psychosocial in nature, so an instrument that determines beliefs about health and exercise would be expected to measure the gradations of change occurring in that process.

In attempting to distinguish categories that entail the assessment of mental states or beliefs, it appears that there are too many unmeasured variables involved to

make any authoritative, integrative statements. Available statistical tools are still limited when looking to them for results that can provide the foundation for models that take into account all variables in an interactive fashion. In the study of behavior, whatever the behavior or the context, valuable information is lost without a method that can at least crudely assess representative variables across a wide spectrum. Such an undertaking will be massive in scope, and will demand considerable commitment on the part of its research subjects. Such efforts are necessary, however, to finally dispense with the qualifications that must be placed on efforts like the present one. Again, a reference to the list on page 50 (Powell, 1988) will show that about one third were assessed in some way in this study. An illustration of the variables missed unexpectedly encountered in the survey. On the response blank provided subjects to cite reasons for their change in exercise behavior, three specified completing the first survey as the reason. Eight mentioned more favorable weather (the project was conducted in the spring). This serendipity illustrates the sorts of effects that were not anticipated or controlled for in the study, but were identified as having an impact.

An issue that received no definitive answers from this study was that of causality, or whether the beliefs measured caused the subsequently measured behavior. In this study, an improvement in the performance of the

instrument in predicting exercise behavior was noted in the time that elapsed from the first administration to the second. In drawing conclusions about the impact of the variables on the subsequent behavior, while there are some positive indicators, the time period spanned was still too short. Future efforts will need to adopt a longitudinal or prospective format that covers a greater time period than did the current study. It does seem that the simpler the criterion question--e.g. "exercise or no exercise?", as opposed to "what level of exercise?"--the more definitive the answer.

Conclusion

This investigation has served to affirm the beliefs-behavior link for an expanded definition of aerobic exercise, and to provide tentative evidence for a causal relationship of beliefs to exercise behavior. Limitations in the study preclude generalizability to a wide range of populations, but the results do parallel other investigations into the contribution of health beliefs to preventive behavior.

Given the body of work showing the efficacy of intervention studies in changing behavior (Becker et al., 1977; Beck & Lund, 1981), an intervention study involving a population of would-be exercisers seems both more possible and more desirable as a consequence of this study. For the researcher, the perceived barriers are the

time such a study would take and the work of keeping subjects involved whatever their exercise outcome. There have been recommendations for such research on the part of model proponents (Kirscht, 1974; Janz & Becker, 1984), but few investigations attempting such a methodology.

Researchers outside the traditional bailiwick of Health Belief Model research have published research supporting the beliefs-attitude-behavior link, adding more evidence for the validity of the model and its mechanisms (Turk, Rudy, & Salovey, 1984). With the amount of research the Health Belief Model has generated, most of it supportive of the relationship between beliefs and behavior, the step clearly indicated now is identifying ways the learnings may be applied. Psychologists, health educators, and other change agents need to find or generate ways to exploit the clear impact that peoples' perceived barriers to behavior change have on their ability to succeed at lifestyle change involving the adoption of preventive behavior. It seems that such learnings may also be applicable to cessation of behavior, as in the addictions, in the same way that they may apply in the case of exercise. Given the gains possible in public health with even incremental changes in exercise norms and behavior, the need is transparent.

Kiesler and Morton (1988) delineate palpably the ways in which psychology can play a significant role in the public interest, in affecting the health of people and

expanding the role of psychology. Psychologists and health professionals who work with people seeking help with lifestyle change have a potentially powerful tool whose mechanisms will become more apparent with its increased use. Experimentation and commitment are needed to validate the tool and to identify the best forms. Given that groundwork, another avenue for change will be made available.

APPENDIX A
CONTACT LETTER FOR QUESTIONNAIRE

Date

Dear ,

My name is Larry Gage, and I am a counselor on the staff of the Psychological Counseling Services at Trenton State College. I am also a doctoral candidate in counseling psychology at the University of Florida, and as such I am contacting you to request your participation in my dissertation project, a study of peoples' thoughts about health and exercise. Your participation will help a colleague with an important (to him!) project, and afford you two chances to win substantial cash prizes.

What I am requesting are two completions of the enclosed survey, one now and one a month after I receive the first from you. Each survey takes ten to fifteen minutes to complete, with the first reply entering you in a drawing that awards the winner fifty dollars, the second one hundred dollars. Completing both surveys, therefore, makes it possible to win up to \$150. An addressed envelope is enclosed for your first survey, with another envelope for a reply-consent form that allows your survey responses to be completely anonymous. Your surveys will be identified by the last four digits of your home telephone number.

Please, take a few moments to send in your first reply. The reply-consent form enters you in the drawing and lets me know who is to receive the follow-up. Yes, it is possible to send the reply form back and not complete the survey; I am using an honor system. That is the risk I take to insure anonymity for your responses. If anything seems unclear or you have questions about the procedure, please feel free to contact me at 771-2247.

The enclosed items are self explanatory, returnable in the attached envelopes. Simply complete each item and drop in campus mail. Please, do it soon, so it won't get misplaced. I will be grateful for your participation.
Thanks!

Sincerely,

Larry Gage

APPENDIX B
REPLY-CONSENT FORM

INFORMED CONSENT

You are being asked to provide some information about yourself on the enclosed survey, and to complete a similar survey again in one month. The surveys contain questions about your opinions of health and exercise. The purpose of the surveys is to learn about peoples' thoughts about exercise and health, and to determine their pattern of exercise. Once obtained, this information will be valuable for planning exercise programs.

Your return of each of the surveys qualifies you for cash prizes of fifty dollars for the first and one hundred dollars for the second. All participants are eligible for both drawings. Odds of winning are approximately one in two hundred and fifty.

Information you give will be strictly confidential and anonymous. You are asked on the survey answer sheet to provide the last four digits of your home telephone number to enable your responses to be paired. At no time will your name become paired with the data sought in this process, as this certification of participation is under separate cover from your response to the surveys.

Voluntary Consent

I have read and understand the procedure described above. I freely consent to participate. I understand that I am not required to participate and that I may stop participation at any time.

Name (please print) _____

Address _____

Office Telephone _____

SIGNATURE

Date

Larry Gage
Psychological Counseling Services
1926 Pennington Rd.
Hillwood Lakes CN 4700
Trenton, New Jersey 08650-4700
Telephone (609) 771-2247

APPENDIX C
PERSONAL BELIEFS QUESTIONNAIRE

Important! Please enter the last four digits of your home telephone number here: — — — —

PERSONAL BELIEFS QUESTIONNAIRE

The following brief questionnaire is designed to assess beliefs you have about health, sickness and exercise. Everyone has their own set of beliefs; there are no right or wrong answers. Please respond quickly to each item, with the response that first comes to mind. Your answers to the questionnaire will be anonymous, thus completely confidential. Please answer as honestly as possible, answering in the way that best describes your current beliefs about each question. For each item circle the number that comes closest to capturing your belief for that item.

Notice that you may respond using the answer at either end of each scale provided (e.g. Quite concerned; Unconcerned) or any of the five responses in between. An answer of "4" is a balance point between the two ends; in the example above it would mean you were midway between concerned or unconcerned about the issue in question. Sometimes the choice of responses change from one question to the next, so please take care to use the scale paired with the particular question you are answering.

Section 1.

1. Some people are more concerned about their health while others are not as concerned. How concerned are you about your own health?

Quite concerned<----->Unconcerned
1 2 3 4 5 6 7

2. Some people are more concerned about the chance of getting sick, while others are not as concerned. How concerned are you about the chance of getting sick?

Quite concerned<----->Unconcerned
1 2 3 4 5 6 7

3. How good a job are you doing in taking care of your health right now?

Excellent<----->Poor
1 2 3 4 5 6 7

4. How likely is it that you will try to do a better job of taking care of your health in the future?

Very likely<----->Very unlikely
1 2 3 4 5 6 7

5. What best describes the number of individual behaviors or precautions that you engage in to insure your good health?

Many<----->None
1 2 3 4 5 6 7

6. I frequently do things to improve my health.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

7. I search for new information related to my health.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

8. Although I am concerned about my health, there are other things that are more important to me.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

9. In general, the health habits I practice are:

Good<----->Bad
1 2 3 4 5 6 7

Section 2.

For the following ten questions, please respond according to the scale below.

Very likely<----->Very unlikely
1 2 3 4 5 6 7

Record the number indicating your response in the blank to the right of each condition listed below.

How much chance is there that you could ever get:

	Response		Response
10. asthma	_____	15. heart trouble	_____
11. pneumonia	_____	16. strep throat	_____
12. cancer	_____	17. a cold	_____
13. anemia	_____	18. a cavity	_____
14. the flu	_____	19. a stroke	_____

20. Compared to other people my age, I get sick more easily.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

21. How likely do you think it is, in general, that you will get some sort of illness?

Very likely<----->Very unlikely
1 2 3 4 5 6 7

22. Compared to other people my age, I am more likely to have to spend time in bed due to my condition.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

23. I worry a lot about contracting some disease that will prevent me from pursuing normal activities.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

24. My physical health makes it more likely that I will be troubled by disease.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

Section 3.

For the following ten questions, please respond according to the scale below.

Very serious<----->Not at all serious
1 2 3 4 5 6 7

Record the number indicating your response in the blank to the right of each condition listed below.

How serious would it be to get the following condition within the next twelve months?

	Response		Response
25. asthma	_____	30. heart trouble	_____
26. pneumonia	_____	31. strep throat	_____
27. cancer	_____	32. a cold	_____
28. anemia	_____	33. a cavity	_____
29. the flu	_____	34. a stroke	_____

35. Whenever I get sick, it seems to be very serious.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

36. Lacking energy often, for me, would be:

Very serious<----->Not at all serious
1 2 3 4 5 6 7

37. Developing high blood pressure or cardiovascular problems, for me, would be:

Very serious<----->Not at all serious
1 2 3 4 5 6 7

38. Developing nervousness or stress problems, for me, would be:

Very serious<----->Not at all serious
1 2 3 4 5 6 7

39. Becoming overweight, for me, would be:

Very serious<----->Not at all serious
1 2 3 4 5 6 7

Section 4.

For the following sections, the term "regular exercise" refers to aerobic exercise of at least 20 minutes duration, at least 3 times a week. Aerobic exercise is a rhythmic, continuous, sustained exercise such as running, rowing, rope-skipping, bicycling, or swimming that produces an elevated heart rate.

40. How much do you feel maintaining a program of regular exercise will help improve your overall health?

Help a lot<----->Not help at all
1 2 3 4 5 6 7

41. How well do you feel a program of regular exercise will help prevent illness?

Help a lot<----->Not help at all
1 2 3 4 5 6 7

42. A program of regular exercise would make my heart work better.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

43. Regular exercise will help me to tone up my muscles.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

44. A program of regular exercise would help me gain better posture.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

45. A program of regular exercise would help me lose weight.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

46. Regular exercise would really help my appearance.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

Regular Exercise = Aerobic, 20 minutes (or more) per session, 3 times or more/week.

47. Regular exercise would really help increase my energy level.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

48. Participating in a regular exercise program would increase my self respect.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

49. Regular exercise would really help me keep a good outlook on life.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

50. Participating in regular exercise would help me do better thinking.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

51. A program of regular exercise could benefit me by providing friendship and socialization with other exercisers.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

Section 5.

Regular Exercise = Aerobic, 20 minutes (or more) per session, 3 times or more/week.

52. Sometimes I worry that regular exercising can cause health problems.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

53. Sometimes I am concerned that regular vigorous exercising would cause me to have a heart attack.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

54. I am concerned about the possibility of being injured while maintaining a regular exercise program.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

Regular Exercise = Aerobic, 20 minutes (or more) per session, 3 times or more/week.

55. A regular program of exercise would likely make me stiff and sore.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

56. How difficult would you say it is (would be) for you to maintain a regular program of exercise?

Very difficult<----->Very simple
1 2 3 4 5 6 7

57. How much do you feel maintaining a regular program of exercise interferes (would interfere) with your normal activities?

Interfere a lot<----->No interference
1 2 3 4 5 6 7

58. A regular program of exercise is difficult for me to schedule.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

59. Sometimes it seems to me that maintaining a regular program of exercise is more trouble than is worth.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

60. A preference to do other things with my time could keep me from maintaining a regular program of exercise.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

61. Lack of desire or interest could keep me from maintaining a regular program of exercise.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

Regular Exercise = Aerobic, 20 minutes (or more) per session, 3 times or more/week.

62. Unsuitable weather conditions could keep me from maintaining a regular program of exercise.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

Section 6 - Your Exercise Pattern

In response to this question we would like to determine as specifically as possible what category you would place yourself in according to your current status regarding exercising. Please note that it is important for you to respond with your actual level of participation in exercise, as opposed to what you may wish it to be.

"Exercise" is defined for purposes of this question as aerobic exercise of at least 20 minutes duration, at least 3 times a week. Aerobic exercise is a rhythmic, continuous, sustained exercise such as running, rowing, rope-skipping, bicycling, or swimming that produces an elevated heart rate. Please place a check next to the category that describes your current status. Important: If your activity level is significant but does not conform to the definition of regular exercise, be sure to answer Section 7.

Regular Exercise = Aerobic, 20 minutes (or more) per session, 3 times or more/week.

_____ Category 1 - You are in this category if you are not exercising and have not thought about beginning an exercise program at all in the previous year.

_____ Category 2 - You are in this category if you have been seriously thinking about how to begin a regular exercise program in the past year.

_____ Category 3 - You are in this category if have actively tried but not succeeded (started briefly, for less than six months, then stopped) in beginning an exercise program during the past year.

_____ Category 4 - You are in this category if you are not currently in a program of regular exercise, but you have maintained a pattern of regular exercise for over six months at any time in the past five years.

_____ Category 5 - You are in this category if you have begun exercising regularly recently and have continued for a period of up to nine months.

_____ Category 6 - You are in this category if you have maintained a pattern of regular exercise for a period of more than eighteen months.

_____ Category 7 - You are in this category if you are a Category 6 person who exercises daily and for periods of longer than 45 minutes.

If you indicated you are now pursuing a program of regular exercise, please describe the type of exercise; also indicate your usual duration and frequency:

Type_____

Duration_____Minutes/Session.

Frequency_____Times/Week.

Section 7 - Other Activity

Many people who are not aerobic exercisers may do other forms, such as walking, as part of their daily lifestyle. Such activity may be intentional or part of a job; it may be of short or long duration. If you engage in activity that represents exercise, but it is not described by the definition of regular aerobic exercise in Section 6, please detail the activity here:

Type_____

Duration_____Minutes/Session.

Frequency_____Times/Week.

Section 8 - About You

1. Age:_____.

2. Marital Status (circle one): Single Married
Divorced Separated Living Together

3. Terminal Degree (circle one): Bachelors Masters
Doctorate Postdoctorate

4. Body Weight:_____lbs.

This concludes the questionnaire. Thank you for taking the time to complete it. Simply place it in the attached envelope marked "Survey Return" and drop in Campus Mail. Be sure you also return the Reply/Consent form in its envelope so you will be eligible for the drawing. And thank you for participating!!

APPENDIX D
SECOND ADMINISTRATION OF QUESTIONNAIRE

Important! Please enter the last four digits of your home telephone number here: ___ ___ ___ ___

PERSONAL BELIEFS QUESTIONNAIRE

The following brief questionnaire is designed to assess beliefs you have about health, sickness and exercise. Everyone has their own set of beliefs; there are no right or wrong answers. Please respond quickly to each item, with the response that first comes to mind. Your answers to the questionnaire will be anonymous, thus completely confidential. Please answer as honestly as possible, answering in the way that best describes your current beliefs about each question. For each item circle the number that comes closest to capturing your belief for that item.

Notice that you may respond using the answer at either end of each scale provided (e.g. Quite concerned; Unconcerned) or any of the five responses in between. An answer of "4" is a balance point between the two ends; in the example above it would mean you were midway between concerned or unconcerned about the issue in question. Sometimes the choice of responses change from one question to the next, so please take care to use the scale paired with the particular question you are answering.

Section 1.

1. Some people are more concerned about their health while others are not as concerned. How concerned are you about your own health?

Quite concerned<----->Unconcerned
1 2 3 4 5 6 7

2. Some people are more concerned about the chance of getting sick, while others are not as concerned. How concerned are you about the chance of getting sick?

Quite concerned<----->Unconcerned
1 2 3 4 5 6 7

3. How good a job are you doing in taking care of your health right now?

Excellent<----->Poor
1 2 3 4 5 6 7

4. How likely is it that you will try to do a better job of taking care of your health in the future?

Very likely<----->Very unlikely
1 2 3 4 5 6 7

5. What best describes the number of individual behaviors or precautions that you engage in to insure your good health?

Many<----->None
1 2 3 4 5 6 7

6. I frequently do things to improve my health.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

7. I search for new information related to my health.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

8. Although I am concerned about my health, there are other things that are more important to me.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

9. In general, the health habits I practice are:

Good<----->Bad
1 2 3 4 5 6 7

Section 2.

For the following ten questions, please respond according to the scale below.

Very likely<----->Very unlikely
1 2 3 4 5 6 7

Record the number indicating your response in the blank to the right of each condition listed below.

How much chance is there that you could ever get:

	Response		Response
10. asthma	_____	15. heart trouble	_____
11. pneumonia	_____	16. strep throat	_____
12. cancer	_____	17. a cold	_____
13. anemia	_____	18. a cavity	_____
14. the flu	_____	19. a stroke	_____

20. Compared to other people my age, I get sick more easily.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

21. How likely do you think it is, in general, that you will get some sort of illness?

Very likely<----->Very unlikely
1 2 3 4 5 6 7

22. Compared to other people my age, I am more likely to have to spend time in bed due to my condition.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

23. I worry a lot about contracting some disease that will prevent me from pursuing normal activities.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

24. My physical health makes it more likely that I will be troubled by disease.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

Section 3.

For the following ten questions, please respond according to the scale below.

Very serious<----->Not at all serious
1 2 3 4 5 6 7

Record the number indicating your response in the blank to the right of each condition listed below.

How serious would it be to get the following condition within the next twelve months?

	Response		Response
25. asthma	_____	30. heart trouble	_____
26. pneumonia	_____	31. strep throat	_____
27. cancer	_____	32. a cold	_____
28. anemia	_____	33. a cavity	_____
29. the flu	_____	34. a stroke	_____

35. Whenever I get sick, it seems to be very serious.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

36. Lacking energy often, for me, would be:

Very serious<----->Not at all serious
1 2 3 4 5 6 7

37. Developing high blood pressure or cardiovascular problems, for me, would be:

Very serious<----->Not at all serious
1 2 3 4 5 6 7

38. Developing nervousness or stress problems, for me, would be:

Very serious<----->Not at all serious
1 2 3 4 5 6 7

39. Becoming overweight, for me, would be:

Very serious<----->Not at all serious
1 2 3 4 5 6 7

Section 4.

For the following sections, the term "regular exercise" refers to aerobic exercise of at least 20 minutes duration, at least 3 times a week. Aerobic exercise is a rhythmic, continuous, sustained exercise such as running, rowing, rope-skipping, bicycling, or swimming that produces an elevated heart rate.

40. How much do you feel maintaining a program of regular exercise will help improve your overall health?

Help a lot<----->Not help at all
1 2 3 4 5 6 7

41. How well do you feel a program of regular exercise will help prevent illness?

Help a lot<----->Not help at all
1 2 3 4 5 6 7

42. A program of regular exercise would make my heart work better.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

43. Regular exercise will help me to tone up my muscles.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

44. A program of regular exercise would help me gain better posture.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

45. A program of regular exercise would help me lose weight.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

46. Regular exercise would really help my appearance.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

Regular Exercise = Aerobic, 20 minutes (or more) per session, 3 times or more/week.

47. Regular exercise would really help increase my energy level.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

48. Participating in a regular exercise program would increase my self respect.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

49. Regular exercise would really help me keep a good outlook on life.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

50. Participating in regular exercise would help me do better thinking.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

51. A program of regular exercise could benefit me by providing friendship and socialization with other exercisers.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

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52. Sometimes I worry that regular exercising can cause health problems.

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53. Sometimes I am concerned that regular vigorous exercising would cause me to have a heart attack.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

54. I am concerned about the possibility of being injured while maintaining a regular exercise program.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

Regular Exercise = Aerobic, 20 minutes (or more) per session, 3 times or more/week.

55. A regular program of exercise would likely make me stiff and sore.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

56. How difficult would you say it is (would be) for you to maintain a regular program of exercise?

Very difficult<----->Very simple
1 2 3 4 5 6 7

57. How much do you feel maintaining a regular program of exercise interferes (would interfere) with your normal activities?

Interfere a lot<----->No interference
1 2 3 4 5 6 7

58. A regular program of exercise is difficult for me to schedule.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

59. Sometimes it seems to me that maintaining a regular program of exercise is more trouble than is worth.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

60. A preference to do other things with my time could keep me from maintaining a regular program of exercise.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

61. Lack of desire or interest could keep me from maintaining a regular program of exercise.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

Regular Exercise = Aerobic, 20 minutes (or more) per session, 3 times or more/week.

62. Unsuitable weather conditions could keep me from maintaining a regular program of exercise.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

Section 6 - Your Exercise Pattern

In response to this question we would like to determine as specifically as possible what category you would place yourself in according to your current status regarding exercising. Please note that it is important for you to respond with your actual level of participation in exercise, as opposed to what you may wish it to be.

"Exercise" is defined for purposes of this question as aerobic exercise of at least 20 minutes duration, at least 3 times a week. Aerobic exercise is a rhythmic, continuous, sustained exercise such as running, rowing, rope-skipping, bicycling, or swimming that produces an elevated heart rate. Please place a check next to the category that describes your current status. Important: If your activity level is significant but does not conform to the definition of regular exercise, be sure to answer Section 7.

Regular Exercise = Aerobic, 20 minutes (or more) per session, 3 times or more/week.

_____ Category 1 - You are in this category if you are not exercising and have not thought about beginning an exercise program at all in the previous year.

_____ Category 2 - You are in this category if you have been seriously thinking about how to begin a regular exercise program in the past year.

_____ Category 3 - You are in this category if have actively tried but not succeeded (started briefly, for less than six months, then stopped) in beginning an exercise program during the past year.

_____ Category 4 - You are in this category if you are not currently in a program of regular exercise, but you have maintained a pattern of regular exercise for over six months at any time in the past five years.

_____ Category 5 - You are in this category if you have begun exercising regularly recently and have continued for a period of up to nine months.

_____ Category 6 - You are in this category if you have maintained a pattern of regular exercise for a period of more than eighteen months.

_____ Category 7 - You are in this category if you are a Category 6 person who exercises daily and for periods of longer than 45 minutes.

If you indicated you are now pursuing a program of regular exercise, please describe the type of exercise; also indicate your usual duration and frequency:

Type_____

Duration_____Minutes/Session.

Frequency_____Times/Week.

Section 7 - Other Activity

Many people who are not aerobic exercisers may do other forms, such as walking, as part of their daily lifestyle. Such activity may be intentional or part of a job; it may be of short or long duration. If you engage in activity that represents exercise, but it is not described by the definition of regular aerobic exercise in Section 6, please detail the activity here:

Type_____

Duration_____Minutes/Session.

Frequency_____Times/Week.

Section 8 - Changes in Exercise Status

If the information recorded above represents a change in your activity or exercise status since your first response to this survey, please detail the change below.

Add/Discontinue what activity?_____

To what do you attribute the change?_____

Section 9 - About You ****Note: Different Questions****

1. Sex (circle one): Male Female

2. Race/Ethnicity (circle one): White/Caucasian
Black/African American Hispanic/Latino Native
American Asian/Pacific Islander Other

3. Body Weight: _____ lbs.

This concludes the questionnaire. Thank you for taking the time to complete it again! Simply place it in the attached envelope marked "Survey Return" and drop in Campus Mail. Be sure you also return the Reply/Consent form in its envelope so you will be eligible for the second drawing.

APPENDIX E
LIST OF ORIGINAL ITEMS AND ASSIGNED CODES

###-Denotes items removed from scale in instrument tests.

Health Motivation

<H1> 1. Some people are more concerned about their health while others are not as concerned. How concerned are you about your own health?

Quite concerned<----->Unconcerned
1 2 3 4 5 6 7

<H2> 2. Some people are more concerned about the chance of getting sick, while others are not as concerned. How concerned are you about the chance of getting sick?

Quite concerned<----->Unconcerned
1 2 3 4 5 6 7

<H3> 3. How good a job are you doing in taking care of your health right now?

Excellent<----->Poor
1 2 3 4 5 6 7

<H4> 4. How likely is it that you will try to do a better job of taking care of your health in the future?

Very likely<----->Very unlikely
1 2 3 4 5 6 7

<H5> 5. What best describes the number of individual behaviors or precautions that you engage in to insure your good health?

Many<----->None
1 2 3 4 5 6 7

<H6> 6. I frequently do things to improve my health.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<H7> 7. I search for new information related to my health.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

###<H8> 8. Although I am concerned about my health, there are other things that are more important to me.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<H9> 9. In general, the health habits I practice are:

Good<----->Bad
1 2 3 4 5 6 7

Susceptibility

For the following ten questions, please respond according to the scale below.

Very likely<----->Very unlikely
1 2 3 4 5 6 7

Record the number indicating your response in the blank to the right of each condition listed below.

How much chance is there that you could ever get:

###<S1> 10. asthma	<S6> 15. heart trouble
<S2> 11. pneumonia	<S7> 16. strep throat
<S3> 12. cancer	<S8> 17. a cold
<S4> 13. anemia	<S9> 18. a cavity
<S5> 14. the flu	<S10>19. a stroke

<S11> 20. Compared to other people my age, I get sick more easily.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<S12> 21. How likely do you think it is, in general, that you will get some sort of illness?

Very likely<----->Very unlikely
1 2 3 4 5 6 7

<S13> 22. Compared to other people my age, I am more likely to have to spend time in bed due to my condition.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<S14> 23. I worry a lot about contracting some disease that will prevent me from pursuing normal activities.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<S15> 24. My physical health makes it more likely that I will be troubled by disease.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

Severity

For the following ten questions, please respond according to the scale below.

Very serious<----->Not at all serious
1 2 3 4 5 6 7

Record the number indicating your response in the blank to the right of each condition listed below.

How serious would it be to get the following condition within the next twelve months?

<V1> 10. asthma	<V6> 15. heart trouble
<V2> 11. pneumonia	<V7> 16. strep throat
<V3> 12. cancer	###<V8> 17. a cold
<V4> 13. anemia	###<V9> 18. a cavity
<V5> 14. the flu	<V10>19. a stroke

###<V11> 35. Whenever I get sick, it seems to be very serious.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

###<V12> 36. Lacking energy often, for me, would be:

Very serious<----->Not at all serious
1 2 3 4 5 6 7

<V13> 37. Developing high blood pressure or cardiovascular problems, for me, would be:

Very serious<----->Not at all serious
1 2 3 4 5 6 7

<V14> 38. Developing nervousness or stress problems, for me, would be:

Very serious<----->Not at all serious
1 2 3 4 5 6 7

###<V15> 39. Becoming overweight, for me, would be:

Very serious<----->Not at all serious
1 2 3 4 5 6 7

Benefits of Aerobic Exercise

For the following sections, the term "regular exercise" refers to aerobic exercise of at least 20 minutes duration, at least 3 times a week. Aerobic exercise is a rhythmic, continuous, sustained exercise such as running, rowing, rope-skipping, bicycling, or swimming that produces an elevated heart rate.

<B1> 40. How much do you feel maintaining a program of regular exercise will help improve your overall health?

Help a lot<----->Not help at all
1 2 3 4 5 6 7

<B2> 41. How well do you feel a program of regular exercise will help prevent illness?

Help a lot<----->Not help at all
1 2 3 4 5 6 7

<B3> 42. A program of regular exercise would make my heart work better.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<B4> 43. Regular exercise will help me to tone up my muscles.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<B5> 44. A program of regular exercise would help me gain better posture.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<B6> 45. A program of regular exercise would help me lose weight.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<B7> 46. Regular exercise would really help my appearance.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<B8> 47. Regular exercise would really help increase my energy level.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<B9> 48. Participating in a regular exercise program would increase my self respect.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<B10> 49. Regular exercise would really help me keep a good outlook on life.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<B11> 50. Participating in regular exercise would help me do better thinking.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

###<B12> 51. A program of regular exercise could benefit me by providing friendship and socialization with other exercisers.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

Barriers to Aerobic Exercise

###<R1> 52. Sometimes I worry that regular exercising can cause health problems.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<R2> 53. Sometimes I am concerned that regular vigorous exercising would cause me to have a heart attack.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<R3> 54. I am concerned about the possibility of being injured while maintaining a regular exercise program.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<R4> 55. A regular program of exercise would likely make me stiff and sore.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<R5> 56. How difficult would you say it is (would be) for you to maintain a regular program of exercise?

Very difficult<----->Very simple
1 2 3 4 5 6 7

<R6> 57. How much do you feel maintaining a regular program of exercise interferes (would interfere) with your normal activities?

Interfere a lot<----->No interference
1 2 3 4 5 6 7

<R7> 58. A regular program of exercise is difficult for me to schedule.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<R8> 59. Sometimes it seems to me that maintaining a regular program of exercise is more trouble than is worth.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<R9> 60. A preference to do other things with my time could keep me from maintaining a regular program of exercise.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<R10> 61. Lack of desire or interest could keep me from maintaining a regular program of exercise.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

<R11> 62. Unsuitable weather conditions could keep me from maintaining a regular program of exercise.

Strongly agree<----->Strongly disagree
1 2 3 4 5 6 7

REFERENCES

- Afifi, A.A., & Clark, V. (1984). Computer-Aided Multivariate Analysis. Lifetime Learning Publications: Belmont, California.
- Ajzen, I., & Fishbein, M. (1977). Attitude-behavior relations: A theoretical analysis and review of empirical research. Psychological Bulletin, 84, 888-918.
- American College of Sports Medicine. (1978). The recommended quantity and quality of exercise for developing and maintaining fitness in healthy adults. Medicine and Science in Sports, 10(3), vii-x.
- Anastasi, A. (1988). Psychological Testing (Sixth edition). New York: Macmillan.
- Bahrke, M.S., & Morgan, W.P. (1978). Anxiety reduction following exercise and meditation. Cognitive Therapy and Research, 2(4), 323-333.
- Bandura, A. (1982). Self-efficacy mechanism in human agency. American Psychologist, 37(2), 122-147.
- Beck, K.H., & Lund, A.K. (1981). The effects of health threat seriousness and personal efficacy upon intentions and behavior. Journal of Applied Social Psychology, 11, 401-415.
- Becker, M.H., Drachman, R.H., & Kirscht, J.P. (1974). A new approach to explaining sick-role behavior in low-income populations. American Journal of Public Health, 64(3), 205-216.
- Becker, M.H., Haefner, D.P., Kasl, S.V., Kirscht, J.P., Maiman, L.A., & Rosenstock, I.M. (1977). Selected psychosocial models and correlates of individual health related behaviors. Medical Care, 15(5), Supplement, 27-46.
- Becker, M.H., & Maiman, L.A. (1975). Sociobehavioral determinants of compliance with health and medical care recommendations. Medical Care, 13, 10-24

- Becker, M.H., Maiman, L.A., Kirscht, J.P. Haefner, D.P., & Drachman, R.H. (1977). The health belief model and prediction of dietary compliance: A field experiment. Journal of Health and Social Behavior, 18, 348-366.
- Becker, M.H., & Maiman, L.A. (1980). Strategies for enhancing patient compliance. Journal of Community Health, 6(2), 113-135.
- Belloc, N.B., & Breslow, L. (1972). The relation of physical health status and health practices. Preventive Medicine, 1, 409-421.
- Blair, S.N., Kohl, H.W., Paffenbarger, R.S., Clark, D.G., Cooper, K.H. & Gibbons, L.W. (1989). Physical fitness and all-cause mortality: A prospective study of healthy men and women. Journal of the American Medical Association, 262(17), 2395-2401.
- Carmody, T.P., Senner, J.W., Malinow, M.R., & Matarazzo, J.D. (1980). Physical exercise rehabilitation: Long-term dropout rate in cardiac patients. Journal of Behavioral Medicine, 3, 163-168.
- Champion, V.L. (1984). Instrument development for health belief model constructs. Advances in Nursing Science, (April), 73-85.
- Chen, M., & Tatsuoka, M. (1984). The relationship between American women's preventive dental behavior and dental health beliefs. Social Science in Medicine, 19(9), 971-978.
- Cioffi, J.P. (1980). The effect of health status feedback on health beliefs: An inquiry into the prebehavioral outcomes of a health hazard appraisal. Medical Care, 18, 41-47.
- Cook, T.D., & Campbell, D.T. (1979). Quasi-experimentation: Design and analysis issues for field settings. Chicago: Rand McNally College Publishing Co.
- Cooper, J., & Croyle, R.T. (1984). Attitudes and attitude change. Annual Review of Psychology, 35, 395-426.
- Cronbach, L.J. (1970). Essentials of psychological testing. New York: Harper and Row.
- Cummings, K.M., Jette, A.M., & Rosenstock, I.M. (1978). Construct validation of the Health Belief Model. Health Education Monographs, 6(4), 394-405.

- Cummings, K.M., Becker, M.H., & Maile, M.C. (1980). Bringing the models together: An empirical approach to combining variables used to explain health actions. Journal of Behavioral Medicine, 3(2), 123-145.
- Department of Health and Human Services. (1980). Promoting health/preventing disease: Objectives for the nation. Washington, DC: U.S. Government Printing Office.
- Department of Health Education and Welfare. (1979). Healthy people: The surgeon general's report on health promotion and disease prevention. (DHEW [PHS] Publication No. 79-55071). Washington, DC: U.S. Government Printing Office.
- Diekstra, R.F., & Jansen, M.A. (1988). Psychology's role in the new health care systems: The importance of psychological interventions in primary health care. Psychotherapy, 25(3), 344-351.
- Dishman, R.K. (1981). Prediction of adherence to habitual physical activity. In F.J. Nagle & H.J. Montoye (Eds.) Exercise in health and disease (pp. 259-275). Springfield, IL: Charles C. Thomas.
- Dishman, R.K. (1982). Compliance/adherence in health-related exercise. Health Psychology, 1(3), 237-267.
- Dishman, R.K. (Ed.). (1988). Exercise adherence: Its impact on public health. Champaign, IL: Human Kinetics Books.
- Dishman, R.K., & Gettman, L.R. (1980). Psychobiologic influences on exercise adherence. Journal of Sports Psychology, 2, 295-310.
- Dishman, R.K., Ickes, W., & Morgan W.P. (1980). Self-motivation and adherence to habitual physical activity. Journal of Applied Social Psychology, 10, 115-132.
- Epstein, L.H., & Wing, R.R. (1980). Aerobic exercise and weight. Addictive Behaviors, 5, 371-388.
- Folkins, C.H., & Sime, W.E. (1981). Physical fitness training and mental health. American Psychologist, 36, 373-389.
- Franklin, B.A. (1978). Motivating and educating adults to exercise. Journal of Physical Education and Recreation, (June), 13-17.

- Gale, J.E., Eckhoff, W.T., Mogel, S.F., & Rodnick, J.E. (1984). Factors related to adherence to an exercise program for healthy adults. Medicine and Science in Sports and Exercise, 16(6), 544-549.
- Given, C.W., Given, B.A., Gallin, R.S., & Condon, J.W. (1983). Development of scales to measure beliefs of diabetic patients. Research in Nursing and Health, 6, 127-141.
- Godin, G., & Shepard, R.J. (1986). Importance of type of attitude to the study of exercise-behavior. Psychological Reports, 58, 991-1000.
- Gorsuch, R. (1983). Factor analysis (Second edition). Hillsdale, NJ: Lawrence Erlbaum Associates.
- Greist, J.H., Klein, M.H., Eischens, R.R., Faris, J., Gurman, A.S., & Morgan, W.P. (1979). Running as treatment for depression. Comprehensive Psychiatry, 20, 41-54.
- Harris, D.M., & Guten, S. (1979). Health protective behavior: An exploratory study. Journal of Health and Social Behavior, 20, 17-29.
- Horn, D. (1976). A model for the study of personal choice health behaviour. International Journal of Health Education, 19, 89-98.
- Hughes, J.R. (1984). Psychological effects of habitual aerobic exercise: A critical review. Preventive Medicine, 13, 66 -78.
- Isaac, S., & Michael, W.B. (1983). Handbook in Research and Evaluation (Second Edition). San Diego, CA: EdITS Publishers.
- Janis, I.L. (1983). The role of social support in adherence to stressful decisions. American Psychologist, 38(2), 143-160.
- Janz, N.K., & Becker, M.H. (1984). The Health Belief Model: A decade later. Health Education Quarterly, 11(1), 1-47.
- Jette, A.M., Cummings, M., Brock, B.M., Phelps, M.C., & Naessens, J. (1981). The structure and reliability of health belief indices. Health Services Research, 16(1), 81-98.
- Kaplan, R.M. (1984). The connection between clinical health promotion and health status: A critical overview. American Psychologist, 39(7), 755-765.

- Kasl, S.V., & Cobb, S. (1966). Health behavior, illness behavior, and sick role behavior. 1. Health and illness behavior. Archives of Environmental Health, 12, 246-266.
- Keppel, G. (1973). Design and analysis: A researcher's handbook. Englewood Cliffs, N.J.: Prentice Hall.
- Kerlinger, F.N., & Pedhazur, E.J. (1973). Multiple regression in behavioral research. New York: Holt, Rinehart and Winston.
- Kiesler, C.A., & Morton, T.L. (1988). Psychology and public policy in the "health care revolution". American Psychologist, 43(12), 993-1003.
- Kirscht, J.P., Haefner, D., Kegeles, S., & Rosenstock, I.M. (1966). A national study of health beliefs. Journal of Health and Human Behavior, 7, 248-254.
- Kirscht, J.P. (1974). Research related to the modification of health beliefs. Health Education Monographs, 2(4), 455-469.
- Kirscht, J.P. (1983). Preventive health behavior: A review of research and issues. Health Psychology, 2(3), 277-301.
- Knapp, D.N. (1988). Behavioral management techniques and exercise promotion. In R.K. Dishman (Ed.), Exercise adherence: Its impact on public health (pp. 203-235). Champaign, IL: Human Kinetics Books.
- Knowles, J.H. (1977). The responsibility of the individual. In J.H. Knowles (Ed.), Doing better and feeling worse (pp. 57-80). New York: Norton.
- LaPorte, R.E., Montoye, H.J., & Caspersen, C.J. (1985). Assessment of physical activity in epidemiologic research: Problems and prospects. Public Health Reports, 100(2), 131-146.
- Lau, R.R., Hartman, K.A., & Ware, J.E. (1986). Health as a value: Methodological and theoretical considerations. Health Psychology, 5(1), 25-43.
- Lewin, K. (1935). A dynamic theory of personality. London: McGraw-Hill.
- Maiman, L.A. & Becker, M.H. (1974). The health belief model: Origins and correlates in psychological theory. Health Education Monographs, 2(4), 336-353.

- Maiman, L.A., Becker, M.H., Kirscht, J.P., Haefner, D.P., & Drachman, R.H. (1977). Scales for measuring health belief model dimensions: A test of predictive value, internal consistency, and relationship among beliefs. Health Education Monographs, 5, 215-230.
- Martin, J.E. (1981). Exercise management: Shaping and maintaining physical fitness. Behavioral Medicine Advances, 4, 3-5.
- Martin, J.E., & Dubbert, P.M. (1982). Exercise applications and promotion in behavioral medicine: Current status and future directions. Journal of Consulting and Clinical Psychology, 50, 1004-1017.
- Martin, J.E., Dubbert, P.M., Katell, A.D., Thompson, J.K., Raczynski, J.R., Lake, M., Smith, P.O., Webster, J.S., Sikora, T., & Cohen, R.E. (1984). Behavioral control of exercise in sedentary adults: Studies 1 through 6. Journal of Consulting and Clinical Psychology, 52(5), 795-811.
- Matarazzo, J.D. (1980). Behavioral health and behavioral medicine: Frontiers for a new health psychology. American Psychologist, 35(9), 807-817.
- McAlister, L., Farquhar, J.W., Thoresen, C.E., & Maccoby, N. (1976). Behavioral science applied to cardiovascular health: Progress and research needs in the modification of risk-taking habits in adult populations. Health Education Monographs, 4(1), 45-73.
- Meichenbaum, D., & Turk, D.C. (1987). Facilitating treatment adherence. New York: Plenum Press.
- Morgan, W.P. (1981). Psychological benefits of physical activity. In F. Nagle & L.H. Montoye (Eds.), Exercise health and disease (pp. 299-314). Springfield, IL: Charles C. Thomas.
- Morgan, W.P., & O'Conner, P.J. (1988). Exercise and mental health. In R.K. Dishman (Ed.), Exercise adherence: Its impact on public health (pp. 91-121). Champaign, IL: Human Kinetics Books.
- Naughton, J.P. (1974). Physical activity and coronary heart disease. In P.K. Wilson (Ed.), Adult fitness and cardiac rehabilitation (pp. 3-80). Baltimore: University Park Press.

- O'Connell, J.K., Price, J.H., Roberts, S.M., Jurs, S.G., & McKinley, R. (1985). Utilizing the Health Belief Model to predict dieting and exercising behavior of obese and nonobese adolescents. Health Education Quarterly, 12(4), 343-351.
- Oldridge, N.B. (1981). Dropout and potential compliance: Improving strategies in exercise rehabilitation. In F.J. Nagle & H.J. Montoye (Eds.), Exercise in Health and Disease (pp. 250-258). Springfield, IL: Charles C. Thomas.
- Paffenbarger, R.S., & Hyde, R.T. (1988). Exercise adherence, coronary heart disease, and longevity. In R.K. Dishman (Ed.), Exercise adherence: Its impact on public health (pp. 41-73). Champaign, IL: Human Kinetics Books.
- Perkins, K.A. & Epstein, L.H. (1988). Methodology in exercise adherence research. In R.K. Dishman (Ed.), Exercise adherence: Its impact on public health (pp. 399-416). Champaign, IL: Human Kinetics Books.
- Perri, M.G., & Richards, C.S. (1977). An investigation of naturally occurring episodes of self-controlled behaviors. Journal of Counseling Psychology, 24(3), 178-183.
- Powell, K.E. (1988). Habitual exercise and public health: An epidemiological view. In R.K. Dishman (Ed.), Exercise adherence: Its impact on public health (pp. 15-39). Champaign, IL: Human Kinetics Books.
- Prochaska, J.O., & DiClemente, C.C. (1983). Stages and processes of self change of smoking: Toward an integrative model of change. Journal of Consulting and Clinical Psychology, 51, 390-395.
- Ray, A.A. (Ed.). (1982). SAS user's guide: Statistics. Cary, North Carolina: SAS Institute.
- Riddle, P.K. (1980). Attitudes, beliefs, behavioral intentions, and behaviors of women and men toward regular jogging. Research Quarterly for Exercise and Sport, 51(4), 663-674.
- Rosenstock, I.M. (1974a). Historical origins of the health belief model. Health Education Monographs, 2(4), 328-335.
- Rosenstock, I.M. (1974b). The health belief model and preventive health behavior. Health Education Monographs, 2(4), 354-386.

- Silver, S.E. (1983). A test of the applicability of the Health Belief Model to the arena of contraceptive decisionmaking. Unpublished doctoral dissertation, University of Florida, Gainesville, Florida.
- Sinyor, D., Schwartz, S.G., Peronnet, F., Brisson, G., & Serganian, P. (1983). Aerobic fitness level and reactivity to psychosocial stress: Physiological, biochemical, and subjective measures. Psychosomatic Medicine, 45(3), 205-215.
- Slenker, S.E., Price, J.H., Roberts, S.M., & Jurs, S.G. (1984). Joggers versus nonexercisers: An analysis of knowledge, attitudes and beliefs about jogging. Research Quarterly for Exercise and Sport, 55(4), 371-378.
- Sohn, R.S., & Micheli, L.J. (1984). The effect of running on the pathogenesis of osteoarthritis of the hips and knees. Medicine and Science in Sports and Exercise, 16, 150.
- A solution for health costs? (1988, 18 December). New York Times, 3, p. 1.
- Sonstroem, R.J. (1982). Attitudes and beliefs in the prediction of exercise participation. In R.C. Cantu & W. J. Gillespie (Eds.), Sports medicine, sports science: Bridging the gap (pp. 3-16). Lexington, MA: Collamore Press.
- Sonstroem, R.J. (1987). Stage model of exercise adoption. Paper presented at the national convention, American Psychological Association, New York, NY.
- Sonstroem, R.J. (1988). Psychological models. In R.K. Dishman (Ed.), Exercise adherence: Its impact on public health (pp. 125-153). Champaign, IL: Human Kinetics Books.
- Stern, M.J. & Cleary, P. (1981). National exercise and heart disease project: Psychosocial changes observed during a low-level exercise program. Archives of Internal Medicine, 141, 1463-1467.
- Suchman, E.A. (1970). Health attitudes and behavior. Archives of Environmental Health, 20, 105-110.
- Taylor, C.B., Sallis, J.F., & Needle, R. (1985). The relation of physical activity and exercise to mental health. Public Health Reports, 100(2), 195-202.

- Thoresen, C.E., & Eagleston, J.R. (1985). Counseling for health. The Counseling Psychologist, 13(1), 15-87.
- Tirrell, B.E., & Hart, L.K. (1980). The relationship of health beliefs and knowledge to exercise compliance in patients after coronary bypass. Heart & Lung, 9(3), 487-493.
- Turk, D.C., Rudy, T.E., & Salovey, P. (1984). Health protection: Attitudes and behaviors of LPNs, teachers and college students. Health Psychology, 3, 189-210.
- Wagner, P.J. (1983). Application of the Health Belief Model to psychosomatic problems: A factor analytic approach. Unpublished manuscript.
- Wallston, B.S., Wallston, K.A., Kaplan, G.D., & Maides, S.A. (1976). Development and validation of the health locus of control (HLC) scale. Journal of Consulting and Clinical Psychology, 44, 580-585.
- Wankel, L.M., & Thompson, C. (1977). Motivating people to be physically active: Self-persuasion vs. balanced decision making. Journal of Applied Social Psychology, 7, 332-340.
- Ward, A., & Morgan, W.P. (1984). Adherence patterns of healthy men and women enrolled in an adult exercise program. Journal of Cardiac Rehabilitation, 4, 143-152.
- Washburn, R.A., & Montoye, H.J. (1986). The assessment of physical activity by questionnaire. American Journal of Epidemiology, 123(4), 563-576.
- Washburn, R.A., Cook, T.C., & LaPorte, R.E. (1989). The objective assessment of physical activity in an occupationally active group. The Journal of Sports Medicine and Physical Fitness, 29(3), 279-284.
- Weinstein, N.D. (1984). Why it won't happen to me: Perceptions of risk factors and susceptibility. Health Psychology, 3(5), 431-457.
- Weintraub, M.S., Rosen, Y., Otto, R., Eisenberg, S., & Breslow, J.L. (1989). Physical exercise conditioning in the absence of weight loss reduces fasting and postprandial triglyceride-rich lipoprotein levels. Circulation, 79(5), 1007-1014.
- Wilfey, D., & Kuncze, J. (1986). Differential physical and psychological effects of exercise. Journal of Health Psychology, 33(3), 337-342.

World Health Organization (1981). Global strategy for health for all by the year 2000. Geneva: World Health Organization.

BIOGRAPHICAL SKETCH

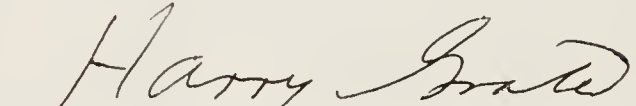
Larry Gage was born on 17 February, 1953, in Fort Lauderdale, Florida. Growing up in south Florida helped to mold Larry's interest in meteorology and the sciences, as a result of several vivid encounters with Atlantic hurricanes. He was selected as the outstanding science student in his class at Stranahan H.S., where he graduated ranked seventh in a class of 770.

Larry's initial undergraduate major at Florida State University was meteorology, which soon lost out to the appeal of psychology and counseling. Following graduation from Florida State in 1975, he left Tallahassee to do master's study at Ohio University in a counselor education program. The affiliation with Ohio University and Athens, Ohio, continued following graduation in 1978, as Larry worked in counseling and administrative capacities at the University College. The experience served to cement Larry's interest in higher education, both as a pursuit and a place to work.

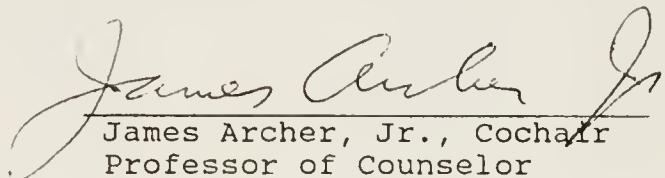
With the encouragement of colleagues, Larry began another round of advanced study, returning to Florida to pursue the doctorate in counseling psychology at the University of Florida. Through study and work, he has pursued the goal of becoming a counseling psychologist. He interned at George Washington University in Washington,

interned at George Washington University in Washington, D.C., finding there an affirmation of his career choice. He has settled near Philadelphia in Doylestown, Pennsylvania, where he lives with his wife Karen Forbes. He joined the staff at the Psychological Counseling Services at Trenton State College in 1988, and will remain there following graduation.

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.


Harry A. Grater, Chair
Professor of Psychology

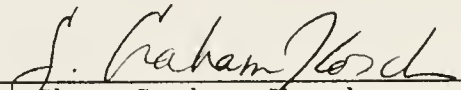
I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.


James Archer, Jr., Cochair
Professor of Counselor
Education

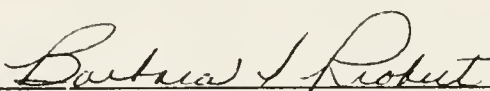
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Margaret L. Fong
Associate Professor of
Counselor Education

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.


Shae Graham Kosch
Associate Professor of
Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.


Barbara S. Probert
Associate Professor of
Psychology

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.


Robert Ziller
Professor of Psychology

This dissertation was submitted to the Graduate Faculty of the Department of Psychology in the College of Liberal Arts and Sciences and to the Graduate School and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

August, 1990

Dean, Graduate School

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